

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION

February 11, 1957 50 cents

**Russians Revise
Distortions of
Aviation History**



North American X-10

Crashes Stir Air Safety Investigation



Astro-nautics
is to space...



as *Aero-nautics* is to earth

In the fields of both *AERO NAUTICS* and *ASTRO NAUTICS* Conair is showing outstanding leadership. CONVAIR *Astro-nautics* is today building in San Diego, California, a complete facility for research, development and manufacturing of the *Airbus International Bulfinch Missile*, a top priority project of the U.S. Air Force. The Atlas is the first of many vital astronomical projects which will lead mankind toward a better understanding of the universe in which he lives.

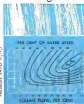


CONVAIR



The Heli-Rotor Compressor

Surge-free • Efficient • No Containment Problems



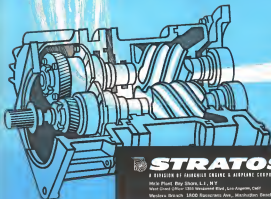
Now available for aircraft applications is a new type of rotary-positive displacement compressor offering these advantages:

- High specific delivery at high speed—up to 42000 cfm. Capacities 25 scfm to 25,000 acfm
- High pressure ratios in single stage (up to 10:1) from small casing air units
- Surge-free operation with compression ratios independent of speed
- High efficiencies resulting from built-in pressure ratios
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- Simple construction—simple control systems

Heli-Rotor compressors are adaptable to a variety of drives—mechanically sealed electric, turbine, hydraulic or direct from an engine. The design of the Heli-Rotor compressor assures unusually long and trouble-free service life. Individual compressors have operated without stopping for as long as 3 years.

In some units, two helical turbo rotors trap the incoming gas, compress it and deliver it to an outlet at design pressure. Two stage machines with a 24 to 1 compression ratio have been designed. The patented design of the rotors is already proved in a variety of aircraft installations.

For more details on these efficient compressors write to:
STRATOS DIVISION, Raytheon & L., N. Y.



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A DIVISION OF AIRCRAFT ENGINE & AIRPLANE CORPORATION

Main Plant: Raytheon, L.I., N.Y.

West Coast Office: 1355 Westwood Blvd., Los Angeles, Calif.

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qualification based upon
Oil, Specification
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for other fluids

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In introducing the SAL-89, Sperry is offering the first production tube featuring grid-controlled pulse operation for ease of modulation. This tube, with its unique technological advances, was designed specifically for air navigation and traffic control service.

With grid control, Sperry has greatly eased the problem of modulating high-power klystrons. For example, only 375-volt pulses are now required to modulate the tube where previously 10,000-volt pulses were necessary. Specially shaped pulses are also easily applied to the tube.

SAL-89 incorporates space-charge focusing, another Sperry development, which eliminates large, heavy magnetic structures and simplifies cooling. Integral resonant cavities make external microwave circuits with their associated sliding contacts unnecessary.

For further information on this new tube, write our Electronic Tube Division.

GENERAL CHARACTERISTICS

Frequency Range: 950 to 3215 Mc
Peak Output Power: 30 kw
V₀ 4 Bias (Negative): 14 to 180 v
Grid 2 to 3 Bias (Positive): 25 to 100 v
V₀ 1 to 2 Bias (Positive): 25 to 100 v

TYPICAL PULSE OPERATION

V₀ 1 to 2 Bias (Positive): 2100 v
Grid 2 to 3 Bias (Positive): 270 v
Grid 4 to 5 Bias (Positive): 270 v
V₀ 1 to 2 Bias (Positive): 25 to 100 v
V₀ 3 to 4 Bias (Positive): 25 to 100 v
V₀ 5 to 6 Bias (Positive): 25 to 100 v

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AIRCRAFT PUMPS

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◆ 附錄 2 附錄 3 附錄 4 附錄 5 附錄 6 附錄 7 附錄 8 附錄 9 附錄 10 附錄 11 附錄 12 附錄 13 附錄 14 附錄 15 附錄 16 附錄 17 附錄 18 附錄 19 附錄 20 附錄 21 附錄 22 附錄 23 附錄 24 附錄 25 附錄 26 附錄 27 附錄 28 附錄 29 附錄 30 附錄 31 附錄 32 附錄 33 附錄 34 附錄 35 附錄 36 附錄 37 附錄 38 附錄 39 附錄 40 附錄 41 附錄 42 附錄 43 附錄 44 附錄 45 附錄 46 附錄 47 附錄 48 附錄 49 附錄 50 附錄 51 附錄 52 附錄 53 附錄 54 附錄 55 附錄 56 附錄 57 附錄 58 附錄 59 附錄 60 附錄 61 附錄 62 附錄 63 附錄 64 附錄 65 附錄 66 附錄 67 附錄 68 附錄 69 附錄 70 附錄 71 附錄 72 附錄 73 附錄 74 附錄 75 附錄 76 附錄 77 附錄 78 附錄 79 附錄 80 附錄 81 附錄 82 附錄 83 附錄 84 附錄 85 附錄 86 附錄 87 附錄 88 附錄 89 附錄 90 附錄 91 附錄 92 附錄 93 附錄 94 附錄 95 附錄 96 附錄 97 附錄 98 附錄 99 附錄 100

Factors prearranging units for various elements equipment are available in single capacities to handle a broad range of requirements. Units consist of an air pump and motor assembly, pressure switch, check valve, tank valve, and normal connection. Tips meet government specifications and can be modified to your needs.



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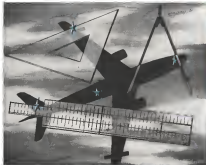


* CHALLENGE STUDIES

High temperatures in safe operating areas in liquid cooled electronics today or similar devices. By virtue of their experience and strong research component, Panasonic put your specific needs at a minimum cost for applications.

* 關於伊爾庫利安和斯維特蘭娜的傳記，參見第 10 章。

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Write for Aviation Products Catalog, Bulletin 330

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- Operates reliably at staggered and reduced.
- Proven 1200 hour "dry test" engine test proves reliability, reliability factor in critical protection device in service.
- Also, Design Flexibility . . . it can easily be tailored to your specific needs.



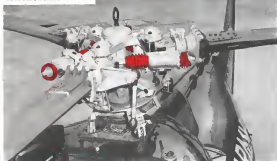
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EXTREME COLD in Arctic operations has little effect on the compact, reliable Mars auxiliary power unit used on the Boeing KC-97 tanker. Often running continuously day in and day out, the dependable Mars-powered generator set keeps the cabin comfortable at below-zero temperatures. It supplies electric power also for engine preheating and starting systems as well as for other auxiliary equipment.

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Perhaps the Mars gas turbine can help solve your need for a light, compact, powerful engine. Write to Dept. C-130, Solar Aircraft Company, San Diego 12, California, for more data on the Mars gas turbine.




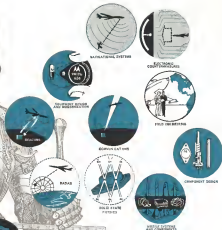
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The titanium industry also has been fighting upstream these past five years. A succession of production upsets and manufacturing waterfalls have been encountered. The dangerous hydropower whirlpool was successfully skirted. The industry has now moved through the low white headwaters to fully competitive rapids with other structural metals.

Titanium alloys of high strength, light weight

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One look and the pilot knows. In a glance he reads actual ground speed and drift angle.

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and many types of military aircraft, these remarkable GPL systems will, one day soon, make flying safer, more convenient and more economical for everyone.



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GPL's auto systems give an instantaneous and continuous display: Ground Speed and Drift Angle, Wind Speed and Direction, Longitude and Latitude, Shortest Enroute To Destination, Steering Signal To Pilot (or auto pilot).

The systems were developed for the Air Force (WADAC). They are the result of an achievement comparable in

significance to the breaking of the sound barrier. GPL's breakthrough of the Doppler effect is an example.

The benefits of these GPL systems extend in every area of flight. There will certainly be just too many to be explored. Already, air lines awaiting delivery of their, high speed air liners are asking: "What is the capability of the equipment and consulting in its sale, development and economical flight operation."

FEBRUARY 11, 1957

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AVIATION WEEK

VOL. 16 NO. 4

New York 36-336 W. 42nd St., Phone 4-0000 (Night 10-4300)
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Los Angeles 17-3125 West Sixth St., Phone MAInland 3-7155
Dallas 1-1072 Commerce St., Phone GLendale 7-3084

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COVER

North America's Aviation X-1B, shown in record low flight attitude, is a test vehicle for X-1B long range vehicle. (Left) X-1B is shown winged in flight in record low attitude, and (right) X-1B is shown in high speed position. First and second phase in X-1B program was conducted on the X-1B, a 44 ft test rocket, and the second research and development phase was accomplished on the X-1B, proving out the aircraft's aerodynamic design as well as its guidance and control systems. Initial operations have begun on the X-1B-64. For more on X-1B see page 28.

Future Carrier 38, 39, 41, 75-Wide World 83-Soviet, 103-Howard Lee

48,774 copies of this issue printed

AVIATION WEEK • FEBRUARY 11, 1957 • Vol. 16, No. 4

The aircraft that
breaks the tradition barrier!



On the new F-27... a complete pneumatic system!



Another of the shelf items—Kidde 2 air driven compressor package including machine expansion, relief valve, pressure switch and inlet pressure regulating device

Designed and built by Kidde engineers to Fairchild's exacting specifications, the Kidde pneumatic system saves approximately 100 pounds, is faster operating, is easier to maintain, and requires no flammable liquids.

Matching the smoothness of her Rolls-Royce prop-jet engine, pneumatic power for the F-27 is furnished by two engine driven box driven Kidde 2 air compressors. The air, stored at 2000 psi is used for operation of auto wheel steering, wheel brakes and anti-skid system, landing gear, up lock, propeller brakes, tail bumper and emergency systems.

Design responsibility for the F-27 pneumatic system rests with Walter Kidde & Company, who can furnish complete pneumatic systems on an off-the-shelf basis, as well as the engineering talent to develop and produce special equipment on request. Get the answers to your pneumatic problems now... by writing Kidde today.

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The world's "Air" Man
Kidde's "air" is the basis and
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District Sales/Engineering Offices: Washington, D. C., Dallas, Ohio, Dallas, Tex.,
Seattle, Wash., St. Louis, Mo., Van Nuys, Calif., Montreal, Canada, Brisbane, N. J.

WHO'S WHERE

In the Front Office

Robert E. Murray, Jr., executive vice president, Pacific Aerial Division, Pan American World Airways, Inc.
R. E. Capper, vice president emeritus, San Diego Division, and Charles F. Harris, vice president emeritus, Western Division, Convair Division of General Dynamics Corp., San Diego, Calif.

Dr. William A. Spies, vice president and director of engineering, and Hugh D. Newbold, production manager, General Motors, Palo Alto, Calif.

Alvin Thomsen, vice president commercial affairs, and John E. Rosenblatt, vice president-administration, Lockheed Aircraft Division.

W. D. Kieppinger, vice president, Synthetic Media Corp., subsidiary of Myles Corporation of America (Canton, N. J.)

Arthur W. Fox and Paul Jennings, vice presidents, Canine Tannery Corp., Phoenix, N. J.

Wesley M. Peters, Jr., vice president in planning and manufacturing, North-Katy Corp., Stanford, Conn.

William W. King, executive vice president and Peter J. Corrao, senior vice president and treasurer, Kidde-Kennedy, Inc., Alpha City, Tenn., vice president, The Radio Corp., Danbury, Conn.

William J. Shedd, vice president and general manager, Commercial Division, Flood Manufacturing Co., Chicago, Ill.

Robert S. Asplund, vice president operations, Chicago Helicopter Airways, Inc., Alhambra, Calif., vice president, Long Beach Aeronautics Co., Long Beach, Calif.
Ray G. Miles, vice president, New Process Corp., Spencer, N. Y.

R. T. Lennett, vice president and director of engineering, Technical Appliances Corp., Phoenix, N. Y.

Henry Ziegler, general manager, Regal Co. Press, Inc., Mt. Zion, N.C., vice president, General Dynamics, a new vice president of Westinghouse (Trenton).

Honors and Elections

Dr. Sam A. McFarland, Associate Professor of Industrial Engineering at the University of Purdue (West Lafayette) received the 1956 John J. Jeffers Award of the Institute of the Aeronautical Sciences for outstanding contributions in the advancement of aeronautics through applied research.

Alan E. Meyer, Chief, Aircraft Division, CNA Technical Development Center, is developing and presenting the first Position of Flight, Supply for a "Museum of Science in Aeronautics."

Charles H. Goddard, manager of Tooling and Tool Engineering, General Motors and Instrument Division of Pacific Corp., was presented the Distinguished Service Award by the Society of the North American II Eagles. The citation reads in part: "For outstanding service to the U. S. Navy in the outstanding performance by Goddard in his distinguished career as a naval aviator of the Navy's highest civilian award."

(Continued on p. 39)

INDUSTRY OBSERVER

►Some F-104s have been fitted with a vertical fin to provide additional directional stability at high Mach numbers. Chord of the fin is 5 ft., and it is 8 in. in span at the forward edge tapering to about 3 in. This extension below the fuselage is a solution to the yawing out of upper vertical fin surface by fuselage and wing at the high angle of attack to high altitude. Flight was suggested in an Aviation Week report (AW Oct. 31, 1955, p. 10).

►Britain is now planning a supersonic research aircraft built outside of standard staff and using a straight, thin wing design for exploration of the Mach 2 to 3 speed range.

►Blackburn and General Aircraft Ltd., Brough, England, is building a prototype supersonic rocket bomber known as the N. A. 39.

►USAF is interested in General's F11F II fighter developed for the Navy. Presently, a General Electric J79 turbojet engine, the F11F II recently reached a speed of 1,225 mph in level flight and flew to an altitude of 72,000 ft. (AW Dec. 24, p. 36). Air Force pilots have been flying the aircraft.

►North American Navaho supersonic transport missile uses a combination of celestial and inertial guidance systems. Celestial is used for en route guidance over the Navaho's 5,000 mile range with celestial guidance switching to an inertial system. Navaho is now being flight tested at USAF Missile Test Center, Cape Canaveral, Fla.

►Information gained from Stanford Research Institute's studies on radio waves from nuclear tests (AW Nov. 25, p. 87) may be applied to global communications and ballistic missile tracking systems. The Stanford studies are under the sponsorship of the Rome Air Development Center.

►Army has had 14 miles of communications wire in less than six minutes from a Sikorsky H34 during tests at Fort Rucker, N. C. With Armadillo-ripped device consisting of an advanced steel tube, the H34 can carry a total of 14 miles of coaxial ground wire and lay five lines at a time. In operation the device is suspended from the helicopter's sling attachment.

►Kaiser Cook Corp., Glendale, Calif., will conduct flight test evaluation of its rocket-powered, strap-on boost helicopter, the Model RH-1, under Navy Bureau of Aeronautics financing. Helicopter which uses the plate legs for landing gear, stands, has been flown at altitudes of 5,000 ft. and speeds above 70 mph. Baker is looking at the RH-1 with an eye towards possible use by the Marine Corps.

►Kale Aircraft Corp., Chula Vista, Calif., will produce 168 power plants for General's Model 880 jet transports. Plants will be built around the General Electric C485 turbojet engine, commercial version of the J79. First deliveries under the \$7 million contract will go to General early next year. Deliveries are scheduled for June 1958.

►Research and development costs for prototype of Auto Aircraft's Mach 2 interceptor, the CF 101, are now estimated at \$200 million, about double the estimate made in late the pre-engineered aircraft first reached the planning stage. First flight of the CF 101 is scheduled for March 1958. Aircraft will be powered by General Motors engines now being built in Toronto. Along with Royal Canadian Air Force, U. S., British and West German aircraft are interested in possible orders.

►Sikorsky Aircraft is considering the development of a turbo-propelled version of its S-58 helicopter embodying larger main and more efficient power. Aside from an auxiliary use, one commercial application would be in offshore oil operations. The turbo-propelled helicopter could carry speed drilling rigs to long-shore offshore sites, saving time and cost, as well as personnel, tools and living accommodations. Commercial development will test the concept in a development program to be conducted in New Guinea (AW Dec. 31, p. 25).

frozen lightning

The Germans called the super-weatherproof trails of their V-2 rockets "frozen lightning." When the Mach 4-5 aircraft now under development fly at 80-90,000 feet and higher, we'll be seeing frozen lightning in our own skies.

Not freezing hot heating will be the real problem at these ultra high speeds. At 3000 mph, the skin and many structural components will be heated to over 3000°F, temperatures too high for alloys now used. Needed: materials strong up to 1200-1300°F for structural lagging and other landing parts.

Engine builders, furnace manufacturers and forge shops are handling similar requirements right now, with Carpenter alloys. These alloys have gained an enviable reputation for uniform high quality, ability to meet tough specifications consistently, improved longevity and exceptional cleanliness. Forging tolerances can be tighter. Freshness are better. Rejects are far fewer.

Drops properties and fabrication instructions for these alloys are summarized in our new booklet, "Carpenter Alloys for Elevated Temperature Service." For your copy drop us a line on your Company letterhead. The Carpenter Steel Company, 126 W. Burn Street, Reading, Pa.

Carpenter STEEL

Improved alloys for elevated temperature service



Washington Roundup

New Look of Airpower

The aircraft industry is in for another investigation, this one by a special Senate task force that will look into the programs of the three services on aircraft procurement, maintenance, operations training and training facilities. The Senate group, formed by Sen. Krosland Johnson (D-Tex.), will be chairmanned by Sen. Stuart Symington (D-Me.). Former Senate majority leader and chairman of the Senate Armed Services Committee was investigating Subcommittee will also serve as the task force, giving it much more potential power than Symington's former subcommittee of last summer. This subcommittee has completed its study and its final report (AW Feb. 4, p. 37). Monthly meetings of the new group will be Sen. Stennis Boggs of New Hampshire.

'Piracy'?

Rep. James Dixon (D-Ga.) is charging defense contractors with "pirating" government and non-defense industries of engineers and technical personnel through excessive recruiting suits.

Dixon has released a News report showing that 37 Navy contractors with a responsibility of defense business had an average recruiting cost of \$1,317 per new engineering employee. One firm, the report says, averaged \$25,328 per hire.

Senate contractors with a responsibility of cost incurred between averaged only \$983 per employee, according to the report. The defense contractors had a total annual sales volume of \$3 billion, of which \$2.8 billion was in government work, and spent \$6.4 million for recruiting in the last half of 1966. The previous year's contractors had a total annual sales volume of \$1.2 billion, of which \$318 million was from government contracts. They spent only \$611,956 on recruiting.

Ray Davis, head of the Manpower Subcommittee of the House Post Office and Civil Service Committee, has also asked the Defense Department to contribute some standards on allowable costs for recruitment by contractors.

"Every day of delay means greater demands for better salaries for government engineers," he said. "These demands are hard to deny as long as the vicious cycle of the failed government competing with staff is permitted to continue."

Naval Views Advertising Costs

New navy newspaper ads for skilled scientific personnel do not pay off. The navy proposed that contractor personnel working for technical personnel in defense contractors be restricted to technical and trade publications but was rebuffed in a conference of procurement agencies.

Founding the Budget

While for Sen. Stuart Symington (D-Me.) to see tortuous made before his approval subcommittee at an event in which to present the administration's defense budget. He now says that Cos. Nathan F. Twining, USAF Chief of Staff, will be questioned on the budget in the light of his recent testimony before the subcommittee last summer. If USAF's loss now looks like the Fiscal 1978 budget is adequate, Symington says the

general is "reasonable" to be Chief of Staff. The budget figure is substantially lower than the Twining Tower told the subcommittee he would send. Sen. Symington, Democrat, former USAF Secretary, also told in NBC "Meet the Press" television audience that the idea that large-scale guided missiles are just around the corner and near enough to production to warrant cutting aircraft order plans "is fantastic misrepresentation."

Classification Report

First advice on how to implement recommendations of the Galtley Committee will be awaiting Defense Secretary Clifford E. Wilson when he returns from vacation next week. The committee has suggested a number of changes to eliminate both overclassification of information and the overclassification of legitimately classified data (AW Nov. 12, p. 28).

Acting on these recommendations, Wilson appointed a Pentagon group to advise him on the suggested changes. Although the group does not expect to complete its proposals for a month and a half, it has decided to turn in the work it has done so far because of the intense interest in the matter shown by the House Government Information Subcommittee.

Airspace Investigation

Look for a congressional subcommittee into military airspace requirements and the amount of airspace over the U.S. now blocked off for military use.

Some studies are concerned that commercial traffic is being increasingly restricted to narrow bands of airspace because thousands of square miles of airspace is now even been restricted to military use.

Also in some studies questioning is the problem of jurisdiction in the allocation of airspace. According to a Civil Aeronautics Board official, the CAB can assign airspace for commercial purposes only after it has reached an agreement with the military services.

Pile Confirmed

The Senate Commerce Committee last week unanimously approved the confirmation of James P. Pyle as Administrator of Civil Aeronautics. He has been serving as acting administrator since the death of Charles L. Evans last September.

High Density Traffic Zones

The Civil Aeronautics Board has empowered Civil Aeronautics Administrator James P. Pyle to establish high density traffic zones around major airports throughout the U.S.

The CAB decides to adopt the high density zoning follows a public hearing on the high density requirements conducted by the CAB at Washington National Airport from Aug. 1, 1965, to last July 31. It sets a speed limit of 150 mph within the zone and prohibits landings in clouds when visibility is less than one mile, regardless of VFR clearance. Under special circumstances, the visibility restriction can be lowered to a half mile. The rule also requires radio communication with the airport tower but permits operations to or from high density areas by pilots who obtain a radio fail permission is obtained from the control tower.

—Washington staff



FIRST CANADIAN CL-28, parked in front of hangar at Canada's National plane, is painted with Royal Canadian Air Force markings, including new designation, Canadair Argus. Fuselage, with two bomb bays, aerial sights and doghouse from Bristol Britannia design.

Canadair's CL-28 Designed for Range, Endurance

By William Gargoy

Montreal-Canadair Ltd.'s CL-28 maritime reconnaissance airplane—now officially named the Argus—exceeds its handicapped look with the Bristol Britannia from which it was derived but a vast job of detail engineering to produce a viable combat airplane.

The Argus, designated the CP-107 by the Royal Canadian Air Force, is designed for 74 hr endurance and range of more than 4,000 mi to coast at low altitude the middle reaches of the Atlantic Ocean. There are areas which in World War II were beyond the range of land-based air cover and were the last few days when German submarines attacked convoys after the U-boats had been driven from the coastal regions.

Wings and tail were taken from the Britannia, virtually intact in the blueprint, the principal Britannia legacy is its 17 ft diameter. The major drive fuselage change was "die big cut," breaking the Britannia's full monocoque construction for the twin bomb bays.

In material, the CL-28 has two noteworthy additions:

- Titanium is used for the skin and bulkheads in the firewall sections of all four nacelles where steel otherwise could have been called for. Total of 7,700 lb of titanium, all cold worked with no welding, was used, making for a weight saving of 900 lb.
- Molded glass laminate with honeycomb filling of the same material is used in the vertical fin as a structural casing but as well as a deflector window for

seeing the top fin section as an antenna.

In overall redesign and execution, Canadair followed these guidelines:

- Gross weight as last done in the original specifications was preserved in the final airplane as much as where most when asked of the payload is fast-developing electronic gear.

- Cheaper, or otherwise as they were, was held to a minimum.

- Care constant was a prime consideration.

Halving the live-on weight and holding the live-on changes demanded the same response. As explained by Thomas A. Llanos, CL-28 project engineer, weight was a matter of housekeeping with the RCAF and change a matter of keeping down on the endurance of the cockpit.

When the RCAF would come along with a new piece of electronic gear carried onboard and maintenance was made to hold down weight. The RCAF also was asked to minimize its equipment as first defect equipment could be dropped to make up for its weight increase.

Gross weight of the airplane is considerably below that of the Britannia and empty weight is equally below. Here and there. The original figure for gross weight was given at about 145,000 lb, compared to 167,000 lb for the Britannia 100 (AW June 7 1974, p. 46).

Besides the numerous detail changes to fit the aircraft for combat and to bring materials to American standard comp. there also was a tendency on the part of the project engineers simply to make changes. If the Bristol was world's best, Llanos said, it was left over for the project engineers had other guidelines.

Gross combat became a big factor as the project progressed. First con-



TAIL VIEW of CL-28 designated CP-107 by RCAF, shows modified glass laminate housing on tail fin M4D with electronic gear and deflector insert in radial fin (dark horizontal line). Insert, with honeycomb fill of same material, is part of load carrying structure.

Endurance

interior was given for layout of the tactical computer, and it was placed at the rear of the cabin, considered the most desirable from a low noise and vibration viewpoint.

"We threw out droplets," Harve and "Dorothy" may not mean anything in measuring comfort level. We put and, left a door for a reasonable overhead level, droplets or no droplets."

Canadair discussed the question with the RCAF, and with the competing firms of Bell, Bendish & Newman, Canadair, Moss, Fox, Coleman, Canadair and

- Aluminum fuel pipe for panel clamping, applying the tape directly to the skin.

- Filigree insulation in varying degrees throughout the cabin, depending on varying noise levels. Filigree insulation was used in the section adjacent to the poppets, which, unfortunately, happens to be the rear end.

- Rubber burlap to mount any type of electronic gear or equipment which would rattle.

Effectiveness of these efforts will be ultimately determined when the airplane begins flight tests. Argus No. 1, which was shown to the Canadian military and press recently, is scheduled to fly in April. The first Argus No. 2 will be returned to Canadair for test, and the third airplane will be delivered to the RCAF later in the year. Since testing now is underway on a flight log, tail and wing section aspect.

The cabin arrangement, as seen in the first airplane, has ejection tubes for each bay at the rear of the door, the tubes eject through the bottom of the fuselage. Next are:

- Tactical compartment. First is the main control room, with the vision

grat and scopes mounted along each side, and then set in the floor for available change for operators. On the right at the rear of this compartment into the tactical computer, who takes over command of the airplane when a submarine contact is made.

- Distribution area, where power for various equipment is metered.

- Rest area. This will include four bunks, or at least two bunks and eight sleeping quarters, a dining table with seats for four and a pilot capable of cooking, not much morning preparation after a period.

- Routine navigation computer. Routine navigation is designated from tactical navigation after a contact, and a panel with routine navigation equipment is provided.

- Flight deck. This includes station for the flight engineer on the right behind the pilot, and his compartment is larger than that of the Britannia. The engineer panel and flight gauges are left. The Britannia, partly because of the change to piston engines. However, the control console was changed to conform to American practice, and the pilot's windshields are a large left front and only RCAF, for military use, added for increased visibility ahead, upward and downward. Because of the larger windshields the

cabin loses the low-drag canopy characteristics of the Britannia.

- Nose station, for an observer or bombardier.

Obviously, the airplane will have a crew of 15—three pilots, three navigators, two flight engineers and seven communications and routine gear operators. Two crewmen are provided for each station, for on long patrols the crew will rotate as watches as on a ship.

As a measure of the redesign accuracy, there were about 10,000 drawings released, about 3,000 of them American versions of the British drawings. Over the four months was drawn approximately 100 drawings moved along quickly.

Equal strength was the criterion in changing to American standards. Some gaps were estimated, others determined, but overall the result emerged set to the same level as the Britannia.

In the major change, the cuts for the two bomb bays, the wing area through standard reach the same in the Britannia. The Britannia wing has two bay gaps, and in the CL-28 the forward gap is about 24 in. aft of the rear bulkhead of the forward bomb bay and the rear gap about the same distance ahead of the rear bomb bay forward bulkhead.

Outside the bomb bays, the fuselage structure, with the usual changes in standards, is much the same as the Britannia.

To cover the structural loads through the bomb bay cutouts, heavy channel section extrusions were run on each side of the bay, tapering off quickly, fan and rib of this section. These longons locate the bomb bay cutouts, of the bomb bay to which the doors were hung, and served as an attachment point for the wing. The main cabin bulk was raised outward in the wing to serve as the wing attachment point. Four roughly triangular shaped sec-



TITANIUM skin patch (dark area on nacelle) and bulkheads were used in firewall section

CL-28 Specifications	
Length	125 ft 5 in
Wing span	142 ft 9 1/2 in
Height	36 ft 5 1/2 in
Cruising Range	More than 4,000 mi
Cruising speed	179-200 mph
Maximum speed	More than 280 mph
Maximum altitude	More than 20,000 ft
Propulsion	Four Wright Turbo-Comp
	model R3900-8A/TCTA EAL
Number of Crew	15

one cell was failed, one for each side of each bomb bay to open the full area of the baggage loads in three areas.

Besides the nacelle redesign necessary for the engine, various other alterations were performed.

• **Spolons** were added outboard of the outer nacelle for better maneuverability in tactical situations and for possible addition of wing-mounted stores. They are plain flap type.

• **Fuel tanks** were moved outboard, because of the wing attachment changes, and made to conform to U.S. standard. The outer consists basically of four tanks extending to the outer panel, and holds 6,708 gal. Range can be extended by refueling the operational load and addition of an external bomb bay. Tank designed initially for ferry purposes.

• **Crewed system** is little changed from the Britannia, one change made for

weight saving was an substitution of a half-size pick mechanism for the full-size's size pick flap actuator, as it weight saving means.

• **Bombing** carried out as low critical area as in loading edge inlet wing panel, indicated the Britannia, but British single P41-47 was used as an adherent instead of Redan, as the Britannia However, Canada did not follow Can can choice for an adhesive either, using instead the preference of its own ship people.

Electrical protection is provided by four Westinghouse 40 KVA alternators, driven in Sweden drive units directly connected to the shaft of each engine.

Hydraulic power is absorbed in an air speed machine to give the system a constant speed drive. The total system provides 160 KVA and capable of a 150% overload for 15 min, is mounted in parallel, and three alterna-

CL-28 Transport/Cargo

Canadian Ltd. has hopes of selling a transport/cargo version of its CL-28 medium reconnaissance plane in commercial airlines, but feels the aircraft now are too concerned with big jet transports to draw interest in the project.

Best placed for a commercial transport, Canadian's sales force believes, will be after the jets go into operation and demonstrate to the airlines a need for a supplementary, more economical long-range airplane.

Potential capability of the CL-28 commercial transport version, equipped with Pratt & Whitney engines:

- Gross weight of 200,000 lb.
- Payload of 60,000 lb.
- Cost of \$4.5 million per aircraft.

tion can maintain full engine regime available.

Because of the large amount of auxiliary equipment, Canadian built a rackup of the electrical system and is now testing simulated loads on the power sources.

The wiring was connected to a metal similar to that in the airplane to determine whether there was any interference by induction or from any of the standard instruments in equipment.

Structural static tests have yet to be passed by the definitive test center.

Heating system for wing and control surface deicing, and for cabin heating to provide crew comfort in temperatures as low as -65F, can have limited area with a capacity of more than 2,000,000 BTU/hr.

Nuclear Missile Sub Under Construction

Nuclear powered submarine for launching ballistic missiles designated the SSN 598, is being built at Maye Island Naval Shipyard, Victoria, B.C. One other, the SSN 591, is planned.

Both submarines will have single engines and follow hydrodynamic design principles tested on a one-third experimental model, the Albatross. They probably will carry Navy's first ballistic missile, the Polaris (AW 7, p. 12), over this likely in internal launch.

First conventional submarine with internal launch is the USS Gato, which will be launched at Maye Island with this summer. First atomic submarine with internal launch is the USS (Sub 88CIN) 587 whose hull will be laid at Maye Island by late spring. Both will carry Regulus missiles.

Navy has authorization for 15 nuclear subs and is asking for more in Fiscal 1953 budget.



NORTH AMERICAN X-10 research test vehicle for X-64 Navaho intercontinental cruise missile program has stood open along bridge by which probably contain wiring and plumbing between various components. Further tests maintenance with internal space improvements. X-10 is being left in this photo. Flight testing of X-10 has been scheduled by USAF and company.

Details of X-10 Navaho Test Vehicle



ANGLED lines on nose at root of raised surface apparently indicate full up and full down positions to ease interpretation of photo tracking data. External antennas assure better guidance, telemetry. Casual configuration of X-10 has been replaced in X-10-4 by design with large dihedral delta wings providing stability and control. X-64 is powered by wing root mounted engine.



B-47 Launches Rascal

Proposed stream line B-47 GAN-65 Rascal before flight-off, is test flight at Holloman Air Development Center, N. M., Rascal is guided toward target at supersonic speed by electronic reference, designed to launch general targets from deep points out of reach of enemy fighters, has 180 mi range. Mach 3.5 speed. It has fuel tank and control surface. Rocket engine, built by Bell has three cylinders in vertical line (AW 14, p. 17). Forewings have plumbing system.





High Flying U-2

First picture of Lockheed U-2 high altitude reconnaissance plane shows the extremely high speed wing designed for sustained flight at altitudes above 70,000 ft. Landing gear consists of two fuselage wheels, retractable auxiliary plus two outriggers that are dropped when takeoff. Outriggers are used to prevent high speed takeoff from touching ground during takeoff run. U-2 carries subsonic fuel and is powered by a Pratt & Whitney J57 turbojet of about 11,000 lb. thrust. Right angled wing tips are used for landing purposes. U-2 was designed by Lockheed as a high altitude, test bed for atomic and jet engine sub systems but it now being updated by Collins pilot outfit Lockheed contract for National Advisory Committee for Aeronautics and the Atomic Energy Commission, both in the U.S. and from USAF foreign bases. U-2 is used for sampling stratospheric, ozone and ionospheric conditions and obtaining jet stream data.

Defense Builds Science Corps

Washington—Department of Defense is preparing to require the pay, prestige and working conditions of its top civil and scientific, engineering and management personnel. Within a year, it will compete for this talent on a more equal basis with aircraft and related industries.

Recommendations of the Defense Advisory Committee on Professional and Technical Compensation (AW 10-4, p. 31) dealing with civilian employees have been accepted by Defense Secretary Charles E. Wilson and steps toward implementation are under way. The recommendations call for:

- Expansion of the cooperative education program
- Improved civilian personnel job classification guides.

- Formation of an advisory committee on scientific personnel under the office of the Assistant Secretary of Defense for Research and Development
- Use of paid advertising to recruit or recruit and recruit
- Broadened policy on travel to permit free attendance at professional and scientific meetings
- Revision of the Classification Act of 1949 to give the Defense Department wider flexibility to establish pay rates for civil service grades
- Increase in the number of senior jobs for scientists, engineers and management personnel

The recommendations grew out of a new study, drafted at the invitation of the Defense Department in consulting and retaining equipment

and/or personnel in the face of industry's attractive advantages. A group headed by Charles Hook, chairman of Aerojet Space Corp., national research and development establishment of Aerojet, and the Air Force.

Major complaints of civilian personnel centered on the frustration of competitive salaries and management companies who become service under and service headhunting which make them used as a job more important than competence or productivity in determining pay.

The suggested advisory committee would be charged with a study of the possibility of setting up a senior scientific and engineering service in the Defense Department.

Most of the recommendations have been sent to Wilson over the agreement of Ralph J. Goodson, chairman of the committee on compensation

Unions Map United Front Plan for 1958

By Claude Witte

Washington—Aircraft production outlook will maintain this year for a fourth month to achieve new sales goals in 1958, including expansion of the industry's engineers and a higher management wage.

With an eye toward next year's heavy work of contract negotiations, delegates to the Seventh National Aircraft Conference of the United Automobile Workers have called for a joint meeting of their own district lodges and local with those of the International Union of Machinists to map a new campaign.

For action, the conference recommended a three-point legislative program.

- Federal requirement that companies accepting defense contracts must establish adequate apprentice and training programs. A union spokesman said the goal is to have this legislation written into all contracts.
- New minimum wage for the aircraft industry covered by U.S. contracts that is "an absolute increase" from the current \$1.05 an hour.
- Establishment of a government policy that will deny federal contracts to a company in which an organized strike is in progress.

Among factors union objectives mentioned in the UAW conference:

- Establishment of the master shop as the common enemy close to all union contracts
- Continued efforts to revive industry's job relations system
- Wage increases to "give recognition to the higher skills required"
- Severity against layoffs, encourage pay plan, supplemental unemployment benefits, extension of cooperation with bargaining

Leonard Woodcock, UAW vice president and director of the union's Aircraft Department, told Automotive News there is no immediate prospect of UAW and the International Union of Machinists negotiating a joint campaign.

He said, however, that the aircraft groups now are "one union in spirit" and close to an agreement as just but pending implementation of this program will get under way later this month.

UAW today claims about 228,000 of the industry's union members. IAW has about 160,000. Closing a year of a turbulent effort, Woodcock said, UAW will hold a special convention in June, call of 1958 to implement the union's demands to be placed upon major or civil industry contracts, come up for consideration. Single job contract to be considered. Single job contract to be considered. Single job contract to be considered.

Woodcock plans major emphasis on the union's insistence to organize aircraft industry engineers, along with other and technical workers. UAW feels that the organization of engineers can be resolved only through union organization despite the professional status of these career men.

Woodcock said he anticipates that will be organized in a separate group, apart from the production workers, but will get support from all union members in pressing their demands.

Union spokesmen indicated they will make an intensive drive to organize aircraft workers, now being no collective bargaining, with some special emphasis on new plants being brought into the picture by the changing nature of aerial warfare and needs. Expansion of retirement from into the rank-and-file, for example, is viewed as a new challenge to the union's engineers.

Parallel with this is the shift in the aircraft industry that comes about in those companies where the emphasis is moving from airplanes to missiles.

UAW sees a need for increased employment security, because

ment with Bell Aircraft Corp., where negotiations still are in the air.

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UAW Charges Piasecki Lockout

Washington—Charging a "lockout" of its members at the New Castle Del. plant of Piasecki Aircraft Corp., the United Automobile Workers is pressing the Defense Department to take action against the company. The union says the "lockout" will be prolonged if the government gives the company financial assistance while production is being held up.

In a resolution adopted at UAW's Seventh National Aircraft Conference, the union accused company president Frank M. Piasecki of refusing to employ members of Local 690, which has had a contract in the plant since 1940 and occupies one second of the entire of area (AW 10-4, p. 31).

Piasecki, holding of last a dozen military contracts, purchased the factory from Bell Aircraft Corp. late last fall (AW 10-4, p. 31).

Piasecki former president and board chairman of Vought Aircraft Corp., May 1948. Piasecki was condemned by the union for attempting the Defense forces with "bribe" supported by loans from other sources. He also was accused of trying to "defraud and deceive" UAW members.

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Second major part of the UAW's 1957 program is the demand for an industry-wide apprentice training program. Requirement for such programs would require that Defense Dept. must establish.

One speaker at the UAW conference was Secretary of Labor James P. Mitchell who assured a Labor Dept. spokesman on the subject. The report said the aircraft industry is not preparing to fill its own manpower requirements and only about 30% of its employees return training on the job.

Woodcock calls for "a major national study" and he has suggested the industry for lunch. The union already has begun a drive to ensure Congress in the meantime and a proposal to pass the post-war program, because a strong case before the legislative body.

Defining that the funding of "Piasecki's sub-union tactics" appears to be an expense due on government contracts, UAW demanded that Wilson confirm this in time. It also urged that the union be given the right to participate in management and negotiation efforts.

Union spokesmen on Piasecki Aircraft Corp. took over some Defense contracts since the plant. These are reported to include subcontracting for Piasecki Aircraft Division, the Wright Co. and Wright. They claim Piasecki has laid off all UAW members and is diverting new recruits to the company. Second, the union says that Piasecki is using the money of area (AW 10-4, p. 31).

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Vinson Supports FY 1958 Budget

Washington-Roy. Carl Vinson (D-Ga.), chairman of the powerful House Armed Services Committee, has indicated that he will lend full support to the administration's \$117.7 billion Air Force budget for fiscal 1958 despite criticism that it is inadequate.

Vinson, after having submitted on the budget, later the committee and chief of staff of the three services, termed present U.S. defense forces "the greatest concentration in our peacetime history." He also praised Defense Secretary Charles E. Wilson and his assistant for making a record to be proud of.

Twining Testimony

Under questioning by committee members, USAF Chief of Staff Gen. Nathan Twining testified that he is "not unduly concerned" over the reduction in USAF's fiscal 1958 budget from a "first look" estimate of a total of \$116.6 billion which he made last May.

He told the committee that the Air Force "can do a very fine job and perform its mission with the \$117.7 billion recommended by the President's Air Force Secretary Donald A. Quarles (Rd the committee) that, under the administration's new computing methods, the Air Force will need a total of 117 wings in June.

The 137 wing (operational) the new

administration goal of 125 wings—gained by adding four troop assault wings and a wing equipped with Martin Meteor missiles to the combat inventory. Previously, such wings have not been included in combat wings (the 137 wings will be shut later).

In fiscal 1958, five strategic fighter wings are tactical heavy wings and three fighter bomber wings will be dropped from the inventory to bring USAF's strength down to 125 wings.

Planned Reductions

The planned reductions, Quarles said, "are not arbitrary but stem from a thorough review of the task to be accomplished and the means at our disposal to get the job done."

Other Quarles comments:

- **Air Defense.** Modernization of our national interception will continue by common to the supersonic Convair interceptor aircraft. This will afford, he said, "a very substantial increase in air defense capability" and, in addition, important progress is being made in the world's defense of defense.

- **Tactical Air.** By mid 1958, one tactical fighter group and one fighter wing will be completely equipped with supersonic Convair attack aircraft. Quarles said U.S. defense is also being bolstered because our allies are greatly increased their forces and capabilities in the tactical field and are now able to

accept greater responsibilities.

• **Aviation.** The proposed aviation forces including the Convair B-58 "Fleet" "are adequate to meet our current aviation requirements."

Quarles also presented that of the 1,037 wings will be allocated single and dual place intermediate fighter versions of the F-106 (intermediate of the F-107) are being proposed. Quarles added however, that the other 500 wings will be allocated single and dual place versions of more expensive problems than so anticipated. We felt it prudent, therefore, not to accede to the desire originally contemplated in order to accomplish concentrating first on a greater number of aircraft.

"The F-101 program, he said, "has been reduced, and its production buildup slowed down for the acceptance of significant development development of flight tests, as well as the incorporation of an improved engine in the respects of our production aircraft."

- **Research and Development.** During fiscal 1958, the percentage of contracts at approximately the same level. The \$380 million additional cost for Convair last year (increasing USAF's fiscal 1955 expenditures from \$480 million requested to \$710 million last fiscal 1957 and fiscal 1958) USAF is requesting \$661 million in new money for fiscal 1959.

- **Warning System.** SAGE only now exists in a temporary on emergency, the same schedule at last year.
- **Mapmaker.** The military mapmaker got the mid 1955 has been reduced from \$67,000 to \$25,000.

At the close of the hearing session, Chairman Vinson commended the success and chief of staff for their "forthright and revealing testimony in face the committee."

Budgetary Considerations

Gen. Twining told the committee that budgetary considerations had nothing at all to do with the reductions in the proposed fiscal 1958 strength of the Air Force from 137 to an actual figure of 125.

He added that the increased firepower of weapons and other factors indicate a further reduction in the number of wings over the next few years.

"I have no doubt," Twining said, "the 125 wing force will have far greater striking power than the 137 wing force we had planned earlier. I want to make clear that the better performance expected on new equipment and the increased power planned in new equipment has already indicated to us that a reduction in the number of USAF combat wings was desirable and was proposed in plan reduction without regard to pressures."

House Unit Hits Concentration Of R&D Funds Among Big Firms

Washington-House Small Business Committee last week and concentration of research and development contracts among large firms "now well proven to be the cause of death for independent small business."

In its final report on 1956 development, the committee and the small business research and development contract—now giving "disproportionate subsidy to biggies" which is "contributing immeasurably to an already dangerous degree of industrial concentration."

The committee pointed to figures for the three year 1954-56 period, furnished by the Department of Defense, which show that:

- 500 contractors account for 94% of the total dollar volume of military research and development contracts.
- Of these, 239 private firms received 85% of the total. The 101 universities and non-profit organizations included in the 500 list accounted for only 9% of the dollar volume of research and development business.

Biggest commercial research and development contractor was North American Aviation, Inc., with a total of \$421 million for the three-year period.

The largest non-commercial contractor was Massachusetts Institute of Technology, with a total of \$61 million.

Other major contractors included General Electric Co., \$338 million; Western Electric Co., \$264 million; Boeing Airplane Co., \$211 million; Hughes Aircraft Co., \$203 million; General Dynamics Corp., \$167 million; Glenn L. Martin Co., \$136 million; Bell Aircraft Corp., \$131 million; Aerojet General Corp., \$115 million; Westinghouse Electric, \$101 million; Northrup Aircraft, Inc., \$115 million; Curtiss-Wright Corp., \$93 million; Lockheed Aircraft Corp., \$84 million; United Aircraft Corp., \$67 million; Republic Corp., \$57 million; California Institute of Technology, \$11 million.

Stating that it is "disturbed by the common shadow which is cast on the future by the monopoly of technology by big business," the committee related suggestions that small businesses are not suited to military research and development projects.

"The fact that only 30% of small firms have adequate personnel and facilities to contribute significantly to the program, and the additional fact that small concerns employ only 10% of the research and development scientists would hardly indicate that only 5% of

the research and development output to such firms represents a reasonable distribution of the subsidy," the committee said.

"Moreover," a principal reason many small firms have not hired personnel and developed research facilities is simply that they have not had the money to do so. Given the opportunity to share in government research funds,

small businesses could and would expand their facilities. The fact of present inequality is a definite barrier to defense research, the committee said.

The committee highlighted the benefits which go with research and development contracts. The risk-free character of the contract—without cost, the fact that the defense industry is obtaining valuable research or present contract, the advantage of subsequent commercial application, and the enormous advantages of having a working demonstration of two scientific projects, a body of scientific knowledge, and a government policy.

Collision Device Pessimism Grows

Washington-Airline owners, engineers, pessimistic over the growing list of technical barriers to a self-contained collision warning device, show a growing belief that improved traffic control will be the quickest practical solution.

Even an Air Transport Association official attempt to an airborne device. Hughes Aircraft Co. has officially notified the ATA that it has stepped out, on a self-contained collision avoidance system in a number of technical studies which show that this approach is not feasible with the present state of the art. The Hughes statement, conference American Windup report (Jan. 14 p. 30), concerns with the other findings of Boeing Radio and Collision Radio.

Hughes said that its further computer work on the collision problem "will be based on the premise that a solution lies within the framework of air

traffic control." Faced with the apparent impossibility of getting a fully automatic self-contained collision avoidance system, and the difficulty of implementing a cooperative system which is not effective until a majority of all aircraft are equipped, more and more are being people to reaching the same conclusion in Hughes has.

Despite this, a few airline representatives who attended a recent ATA meeting on the problem indicated that they could not afford to sit back and wait for the express of air traffic control to provide a solution. This was underscored three days after the meeting when a Douglas DC-7B and F-8, old field over Los Angeles and attracted public attention on the problem.

The Air Transport Association expects to draw up a new operational and technical requirement for air collision



Newest Motator

Latest version of USAF's Martin Marietta (AW 10, 25, 30, TM EIC has new guidance system. It will soon start development and availability tests at 9th Air Force AFB, Edwards, North Africa. Trials were to be made last spring by 11th Tactical Missile Squadron which was transferred to Europe where tests were suspended. Whether test was done in final having to move September to U.S.



F-106A Under Cover

Convair F-106A under tarpaulin and en route to the Air Force Flight Test Center from San Diego, where it will be subjected to the shattering tests. F-106A has a conventional swept vertical fin of low aspect area replacing the delta surface of the F-102 from which this plane—formerly designated the F-102B—developed. Other differences: elimination of intake at leading edge, added because of the size rule for but not required in the fighter category; intake ducts cut back almost to the wing leading edge; single point of intake less than implying that with the F-102A, assuming the F-106A being air to test on take with shock waves. Prevalence of the F-106A in the F-102 10th Air Force 371 fighter. First take on for delta delta delta



demers, incorporating all the knowledge gained from the Borden, Collins and Hughes studies. One ATA spokesman sums up the situation this way: "We are starting back where we were two years ago, except we know an awful lot more about the problem."

The ATA will ask the industry to come up with its best proposals on two types of reactors:

- Self-contained, generally existing reactors, similar to the original ATA Phase I requirement, but incorporating improved indications of an impending or early warning position together with some indication of the reactor's closing rate. The original Collins four-quadrant PWR system did not show whether or not it is the forward or rear quadrant was on the left or right side.

- Cooperative, primarily warning indicators with automatic collision avoidance provisions if possible. Two years ago ATA discouraged the cooperative vision approach. Now it will take a fresh look at it all such proposals.

The Douglas statement says: "Study of NACA reports on transonic turbulence indicates that random aerodynamic loads produced by gusts are sufficiently large to prohibit collisions that could

Atomic Powered Turbojets

First turbojet engine to be powered exclusively by heat from an experimental atomic reactor (AW Feb. 4, p. 20) was developed by General Electric Co.'s Aircraft Nuclear Propulsion Department under Atomic Energy Commission supervision. Test occurred in metal test area of AEC's aircraft nuclear propulsion project at the National Reactor Testing Station, Idaho Falls, Idaho. GE's Aircraft Nuclear Propulsion Department is operating reactors for the metal test area (below) and the assembly and maintenance shops and administration area (above). Ralph M. Furman Co., which did mechanical engineering work on these areas, has since done similar work for a new test building, detailed control and component building and supporting facilities for the aircraft project. Other facilities there include a reactor and reactor facilities being designed by Foster, Wheeler, McClellan and Collins of San Francisco for AEC and Air Force, and "additional aircraft engine test facilities" now announced by AEC. Development of the new reactor facilities in Borden and New York. Despite new construction and an AEC statement that the project test "marked a significant advance toward the goal of achieving atom-powered flight," WH-115A reactor booster has been stretched out (AW Nov. 19, p. 27).



Navy Utility Helicopter

Washington—Navy's Bureau of Aeronautics announced last week that Kaman Aircraft Corp., Bloomfield, Conn., has been awarded a contract to develop its first amphibious helicopter for the Navy as preferred by Aviation Week on Jan. 28 (p. 29).

Designated the HU-16, the aircraft will be powered by a General Electric T55 gas turbine engine. Kaman has possessed in the past such with turbine power, but, in this respect, has shown both helicopters with intermediate range. A second Kaman design reflected in the recent competition was a two-seat gas-powered. Sale of the contract was not decided.

It is a significant fraction of cost.

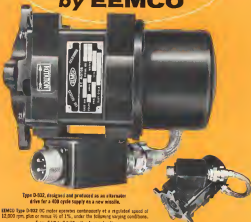
"Even if degradation could result be accepted, the system design would require use of pulse Doppler techniques to minimize the deleterious effects of range uncertainties and ground clutter. A pulse Doppler system, however, is not able to acquire threatening aircraft in the presence of ground clutter, and to provide data required to calculate collision geometry, probably is not economically acceptable to the airlines at

this time because of cost, weight and complexity," Hughes says.

Engine studies also indicate that the EMCO system proposed by Collins is not feasible even for the single personnel, warning indicator because of ground clutter and other problems.

These are serious doubts, however, whether a self-contained PWR can be designed to operate at altitudes below 18,000 feet because of ground clutter problems.

Here's another New DC Motor by EEMCO



Type D-532, designed and produced as an alternative drive for a 400 cycle supply on a new missile.

EEMCO Type D-532 DC motor operates continuously at a regulated speed of 12,000 rpm, plus or minus 1%, under the following varying conditions:
From 5 HP to 2.6 HP with a terminal voltage of 27.5 DC, plus or minus 1.5 volts.

The constant speed of 12,000 rpm is maintained by a frequency regulator that supplies the control field of the double brush motor. Type D-532 has an internal spring, and can be supplied with or without a cold pump filter, which is shown in the description.

Type D-532 is another in the series of new AC and DC motors being custom designed and produced currently by EEMCO for the latest missiles and spacecraft jet aircraft. In fact, there is an EEMCO motor or actuator system on the majority of such new weapons now in production or projected for use by our Armed Forces.

Thus, we believe, is an expression of confidence in EEMCO, which for the past 15 years has specialized exclusively in the design and production of motors and actuators, both linear and rotary, for jet and subsonic aircraft in the aircraft industry.

SPECIFICATIONS FOR TYPE D-532
Type D-532 motor for alternative drive for 400 cycle supply on a missile.
Speed: Continuous at 12,000 rpm.
Voltage: 27.5 DC, plus or minus 1.5%
Speed Control: By frequency regulator supplying control field.
Load: From 5 HP continuous to 2.6 HP maximum.
Terminal Voltage: 27.5 DC plus or minus 1.5 volts.
Weight: With motor and pump filter—12.8 lbs.
With filter alone—11.4 lbs.



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However, there is a substantial expansion now taking place at Hamilton Standard's new and rapidly equipped Windsor Locks, Connecticut, plant due to products order that propellers. Such equipment as fuel controls for jet and rocket aircraft and missiles, starters for jets, air conditioning systems, pneumatic valves, and hydraulic pumps are daily becoming a more significant area of activity with this pre-eminent engineering organization.

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WHEREVER MAN FIES



Britain Probably Will Receive U.S. IRBM and Anti-Aircraft Missiles

London—Plans for British use of U.S. guided missiles are well advanced although not finally agreed upon, Defense Minister David Sandys made clear in the House of Commons last week. Britain probably will be supplied with anti-missile missiles and its immediate range ballistic missiles such as Thor.

Sandys' report on his visit to Washington (AW Feb. 4, p. 25) was almost entirely devoid of any specific information on the various U.S. and British commitments.

In response to a questioner who asserted that a great many people would be extremely unhappy if Britain became a missile rocket launching site, Sandys replied:

"I think that everybody agrees that the world ought to be defended. The only question is whether we can have of effective or ineffective weapons to defend it."

Red Scare

Although Sandys did not mention it, the Russian threat to use ballistic missiles against Britain during the Suez crisis caused a post deal some concern as defense circles here then a generally realized. This has, however, Britain's answer, to be equipped with American IRBM to counter the Soviet menace Britain's own work on this field is lagging seriously.

It was this deficiency almost as much as the defense for only in common agreed that led to Sandys' mission to Washington.

Britain also is eager to update its anti-aircraft defense system. Although possessing possibly the world's finest radar coverage, the United Kingdom lacks the operational missiles to make it an effective defense.

Sandys report on his Washington trip was so vague that some history questioned whether he was being sufficiently frank about its objectives and achievements.

Security Limit

"I have understood to be as frank as I can within the limits of security," the defense minister said. "It is not easy to talk absolutely frankly and freely about these things. Rockets, the use of laser, and so on, are not secret but one can hardly sound very frank."

He made it clear he also had explained the reasons why Britain feels it is necessary to call defense expenditures and that there was a "sympathetic understanding" of his objective.

No Conclusions

When a minister decided to leave without conclusions had been made to the United States to return for the U.S. offer to cooperate in research and development of guided missiles, the defense minister and there was no conclusion whether.

He named the members of Parliament that the arrangement made with the U.S. would increase rather than reduce British knowledge in the missile field.

When asked whether the U.S. was to supply Britain with intermediate and intermediate range ballistic missiles, he said: "I do not think that I want to go into that point because."

A tentative proposal for the adoption by Great Britain of certain American weapons was discussed in Washington and is now being further examined by the two governments and first conclusions are reached. I think that it would be a mistake for me to make any statement of greater detail upon that to the House."

American Use

He also was he only to the question of whether any conditions had been attached to the use of such missiles from American bases in Britain.

The question was the first expectation that U.S. missiles might be supplied to American units operating from British and in much the same way that Strategic Air Command and Third Air Force now operate from bases in the U.K. Previously, it had been assumed that the Washington talks had been devoted to supply of American missiles to British units.

Sandys told Parliament that defense skills will cause a delay in publication of the government's annual White Paper which outlines the defense program.



CRASH-LANDED Globeaster is salvaged in Cook Inlet, Alaska with aid of Pavelec helicopter (designated) used to blow chunks of ice out of the way. Men in boats attached from CG 124 to Inshore support. One of 13 rescued. Plane carried cargo of explosives.

study immediately after the accident to field standards, flight paths and power plant and to incorporate experience. In all, 80 to 90 CAA and CAA security plans are involved.

Constitutional problem for a tightening of an aerial regulations goes along flight tests are prompted in part by PMA's Feb. 11 telegram to let us approach administration.

In the diagram, PMA "suggested" that scientific policy be taken to establish "voluntary" flight area for all test flights. It defined flight tests as a planning similar to that adopted by the CAA in the revised Civil Air Regulations and suggested consultation with military and industry representatives to discuss the problem.

If won the word "voluntary" that reached all the flywheels in the Senate immediately after the accident, Sen. Thomas Kuchel (R-Cal.) asked the Senate for legislation with teeth in it that would designate flight test areas.

After reading PMA's telegram, he called the Senate's attention to a "directive that is issued in military and aerospace forces often than in the form of an enforceable regulation."

Sen. Warren Magnuson (D-Wash.) told Kuchel that he had discussed the problem with the CAA and CAA legal staffs and found "there does not seem to be an unanimity of opinion as to whether a direct authority is an appropriate" basis on the designation of flight test areas.

Congressional Freezes

Other events in Washington leading to the CAA decision were:

- Sen. Magnuson introduced a resolution calling upon the CAA to call off its dogs to permit to regulate air traffic over populated areas.
- Sen. Magnuson also directed an investigation of an space allocation and

control by Sea, MIA Magnuson's own son volunteered.

• In the House, Rep. Edgar Snodgrass (R-Cal.) introduced a similar resolution and added: If the CAA does not have the authority to make such regulations, it should submit to the Congress its recommendations for appropriate legislation to granting such authority.

• Rep. Gus Mink (D-Cal.) chairman of the House Commerce Committee, announced that his group would to some hearings but began last July after the collision between two jets over



880 Antenna Test

Corvus 150 model is used to test Bank-type battery antenna planned for the medium range subsonic aircraft. Top two feet of the 880's vertical fin will be used to create cross-axis shock waves in high frequency communication antenna. Model shown has 17 foot wingspan, is covered with boomie covering to duplicate the skin's desired properties. Transmitter which generates test signals is contained in the model mounted on top of engineering building at San Diego plant. G. S. Fletcher left, antenna project engineer, and W. B. Evans, chief electronics engineer at Corvus San Diego are pictured inspecting the 880 simulator.

The Creed Canyon. Hearings were begun last Wednesday with the testimony of CAA's Oscar Baller.

Northwest Crash

The Northwest Airlines accident at LaGuardia Field was due to a further review of Civil Air Regulations, depending upon the outcome of the CAA investigation.

For example appropriate Civil Air Regulations covering minimum takeoff weight apply not only factors as temperature and runway gradient but does not mention runway surface conditions.

The instrument survey at LaGuardia was covered with three miles of snow when Capt. Alex A. March, pilot of the Northwest DC-66, took off at 6:01 P.M.

Maximum takeoff weight on runway No. 4 used by March was 97,175 lb. for the particular airplane involved. This weight limitation is based on a CAA formula which does not consider condition of runway or weather as factors. The Northwest Airlines DC-66 grossed 98,857 lb. takeoff.

The airplane, on lease from the Flying Tiger Line (AW Jan. 7 p. 49), was two years old and had accumulated 1,515 hours of flight time. Scheduled departure was 7:45 P.M. The plane took off with 105 persons including a crew of six.

Weather at 5:53 P.M. was reported as 500 ft. ceiling and 1 mile visibility with snow and fog. The airline's main-

stream at LaGuardia was 300 ft. and 1 mile.

The plane had been pulled into the hangar at 9:50 P.M. for ice and snow clearance and issued to the flight line at 1:30 P.M. While March was on his final clearance at the runway, the tower cleared night landings and taxi takeoff.

The seventh rowched between 250 and 300 ft. altitude after takeoff and then veered sharply to the left in a turn of about 135 degrees. It crashed on the west end of Rikers Island. Twenty passengers were killed, and 64 of the survivors were hospitalized. The North was not even powered.

March and his left hand of power at takeoff in a strident mood through Alfred Lane. Northwest vice president spokesman: There was an area of ice on the wings at the time of the crash and no electrical trouble before takeoff. March said he was flying on his stomach and was not aware that a crash was imminent.

March, 49, a veteran of more than six decades as pilot, has been served in 10 previous accidents at LaGuardia. On Jan. 14, 1957, he piloted a Northwest Constellation 245 to the East River 100 yards from Rikers Island and on Feb. 8, 1955, it crashed landing shortly after takeoff at the result of propeller and fueling error.

Northwest has 10 DC-66s on order, one of which had been delivered and was in service. The airline leased the Flying Tiger DC-66 in order to begin service only last month and its seventh aircraft New York-Florida route.

The DC-66 was scheduled on a single day coach round trip flight between New York and Miami on Jan. 24 except Wednesday. It also was used as a night coach flight from Miami to New York, on Tuesday only and as a night coach flight on Thursday with from LaGuardia to the Florida terminal.

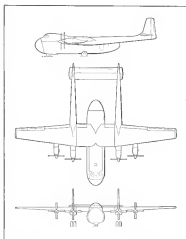
The DC-66 added another dash flight to the airline's schedule for Jan. 20 but with the loss of the lined airplane the company will revert to a one-flight dash from until the second DC-66 is delivered on Feb. 20.

The damaged airplane was owned by Flying Tiger Line Co. \$1,560,000.

Britannia Arrives for Cold Weather Trials

Wingspan, Canada-A Bristol Britannia aircraft has arrived in Wausau after completing a nonstop flight from Pittsburgh, Scotland in 10 hours 52 minutes flying time. The actual "black-to-black" flight of the Britannia was 11 hours 10 minutes.

The plane will remain in Wausau for six weeks to undergo its cold weather trials.



New AW 650

New American Whitcomb 650 turboprop freight/passenger aircraft is being offered as four-engine and two-engine versions and choice of fuselage length. Designer expects multiple versions will enable AW 650 to compete over 90% of world's air routes. It is designed for economic operation and high utilization. Low pressure tires are planned for operation on runways and fields. Flight of first prototype is scheduled before end of 1958 (AW Jan. 11, p. 48). Four-engine version will be powered by Pratt & Whitney Type engines. Two-engine version, AW 650 with two Pratt & Whitney Type engines. Company also is preparing a military version to be known as the AW 650, equipped with four jets.



"In titanium stretch-forming, Mallory-Sharon material most consistent we have tried; simplifies fabrication"



1. Initial forming of titanium sheet at Hart Metal for jet engine. Since Mallory-Sharon titanium is certified in a definite strength range, springback is predictable, and allowed for in this



2. Performed stretch is extended to release stress. With sheet metal, and in a continuous stretch stage, Hart Metal reports that less or flow stress relieving operations are eliminated.

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• Because of titanium's springback characteristics, uniformity is particularly important in supplying forming firms. Mallory-Sharon sheet is preferred material for its consistent properties, the result of strict quality control. Each heat of Mallory-Sharon commercially pure titanium is certified for average strength and limits. For dependable quality, call us for your requirements, and for technical help in applications.



3. Double thickness produced by stretch-forming. United did not in obtaining desired shape with maximum number of operations.



4. Formed skins are checked in future and given final inspection. Fabricator reports very low scrap loss with uniform strength material.



Turboprop Super Constellation in Fast Flight

Lockheed VC-121F Super Constellation, powered by four 3,700-shp Pratt & Whitney T34 turboprop engines, flew 3,540 mi from Long Beach, Calif., to Dover, Del., in 4 hr., 41 min., setting fast propeller transport type time of 5 hr. 15 min. Speed averaged 490 mph at 27,000 ft. Flight was part of MATS operational tests of engines and Hamilton Standard turbo-hydrostatic propellers. Two VC-121Fs are assigned to MATS Continental Division for program.

United, Capital Ask For Fare Increase

Wilmington-Veiled Air Lines request to the Civil Aeronautics Board for a 6% general fare increase received strong support from the airline industry last week.

Although a number of carriers may not follow United's petition for a fare increase to "offset rising costs," the industry is expected to give consistent backing to the airline's move.

Capital Airlines was the first carrier to join United's action. Capital asked for an additional 3% increase in all tickets, regardless of distance plus a general 6% raise in rates.

J. H. Gerschlager, Capital president, termed it United's request "extraneous and trenchant." The last fare raise the carriers would raise an across-the-board 5% increase in 1952. Present coach fares average 44 cents per mile, first-class fares about 60 cents.

In explaining his airline's request, President W. A. Patterson told "United and the air transport industry have been facing the basic problem of rising costs for the past 20 years." He added:

"While other factors of transportation have increased so much as 85% during this period, it is a great tribute to the airline industry that we have continued to absorb rising costs with practically no increase to rate."

American Airlines made no formal petition to the CAB for a rate increase. President C. B. Smith, president of the airline, said he is "hopeful that an increase in fares will be permitted as promptly as possible. Every unit a carrier has adjustment, air travel will continue to be one of America's best bargains."

Thomas Armstrong, Eastern Air Lines president, pressed the proposal of United and Capital and suggested that a 10% fare increase be accomplished without adding any burden to the traveling public if the 10% increase was divided into Airline fares, he said, have increased only 3.2% since 1938.

Fuel charges of most carriers for 1956 are expected to climb as a result of rising costs and not operating profits for the airline industry declined sharply last year as the fact of a 12% increase in revenues. C. B. Smith noted that "the costs of today cannot be met with the fare level of 15 years ago."

United Starts Building Facilities on Coast

San Francisco-Veiled Air Lines will begin construction next month on a multi-million dollar expansion program near the San Francisco International Airport.

The program has been approved by the Federal Aviation Commission and the San Francisco Air Commission. United will construct a large hangar for present and future aircraft, a new flight kitchen for preparation of in-flight meals, an additional engine section, a boiler plant, a crash rack for cleaning airplanes, and a 900-car parking lot for employees.

A new maintenance service area, with underground fueling lines which can service five planes simultaneously, also is included in the plan.

The project is expected to be completed by mid-year of 1959, and is a addition to the 50 acres presently occupied by United at the airport. United's new facilities will be located

on a 60-acre plot, due west of the airport terminal building. The airline currently is negotiating with the city to lease an additional 6 1/2 acres in the same area where is needed for the building program.

The new airline hangar will be a continuous structure covering approximately 125,000 sq. ft., and capable of housing six airplanes at one time. Height measurements are 100 ft. x 367 ft. x 50 ft.

Special walls of standard aluminum will give the building a light gray exterior finish, and radiant heated floors will be installed for the comfort of 1,200 United employees in the hangar.

United employs a total of 5,700 people at the airport.

Architects for the United Air Lines project are Skidmore, Owings, and Merrill of San Francisco.

UAL Earns \$14.6 Million in 1956

United Air Lines earned \$14,680,500 in 1956, an increase from \$13,346,577 the previous year. Sale of capital air craft accounted for \$4,179,400 of the 1956 total, compared with \$88,540 in 1955 aircraft sales.

The 1956 earnings equal \$4.57 per share of United stock, compared with \$3.85 for the 1955 earnings. The airline has declared a quarterly cash dividend of 1 1/2 cents per share and a stock dividend of 4%, payable June 15.

The low cash dividend, with the stock dividend in stock, was attributed by UAL President W. A. Patterson to the need for provision for keeping financially strong during uncertain times in the jet age. Patterson also cited the current tight money market.



AMERICA'S RETALIATORY "REACH" was demonstrated when a Boeing B-52, refueled in flight, recently covered 16,000 miles, nonstop, in 50 hours. The B-52, along with other Boeing Stratofortresses, was

over the North Pole, and ended the perimeter of most of Canada and the United States. Fully loaded for simulated bombing runs, the Boeing B-52s flew at speeds up to 650 mph, and at altitudes up to 50,000 feet.



WINGED REFUELING STATIONS. jet-powered KC-135s, are moving off Boeing production lines on schedule. In service, KC-135s will add thousands of miles of reach to jet-powered bombers and fighters, refueling them at speeds and altitudes best suited to jet operations.



AMERICA'S ONLY JET TRANSPORT, the Boeing 707, parks at Los Angeles airport after being used for extensive flight tests from Seattle. Return flight earned International Air Transport techniques reached Seattle in 1 hour 50 minutes. The 707 is helping officials work out procedures and rules for commercial jet flight in the U. S.



BOMARC. Boeing's Pilotless Aircraft Division is conducting successful flight tests of supersonic defense missiles. Boeing's BOMARC guided missile development includes development of electronic guidance. Launching success, basic supplies and maintenance.

BOEING

Airline Traffic—1956

	Passenger Thousands	Passenger- Miles (Mill)	Load Factor %	U. S. Mail	Express	Freight	Total Revenue Pass-Miles	Per Cent Revenue for Air-Traffic Tax-50%
DOMESTIC								
American	7,704,487	4,400,126	69 49	55,949,049	18,730,413	75,370,848	347,014,480	46 47
Boeing	1,746,119	727,417	66 87	2,283,777	1,341,764	4,134,446	77,586,436	50 56
Capital	3,764,410	1,671,884	67 17	3,357,159	2,341,237	2,562,245	164,857,136	46 62
Continental	710,916	359,295	24 25	871,146	218,295	1,243,434	37,381,189	46 26
Delta	3,205,140	1,707,109	66 13	5,534,123	3,215,967	7,039,971	122,407,183	50 21
Eastern	1,159,500	547,171	63 16	3,267,127	702,367	4,196,256	165,784,796	45 54
Northwest	393,447	176,456	66 35	1,147,150	355,851	1,174,544	11,274,586	50 23
Southwest	1,418,559	679,560	61 25	4,443,026	2,720,771	7,733,427	61,906,777	43 64
Texas West	4,126,242	3,260,310	64 26	12,835,476	4,899,563	15,449,411	184,161,337	50 76
United	6,185,397	4,574,450	66 95	36,178,148	15,746,547	50,147,731	390,473,564	50 67
Western	609,346	458,131	65 90	2,711,721	652,483	1,449,916	48,466,996	54 25
INTERNATIONAL								
American	116,566	59,100	66 32	126,327	4,433	3,450,761	31,496,416	47 15
Boeing	35,361	16,640	67 37	275,427	846,345	7,513,837	21,617,877	51 67
Caribbean Airline	146,864	13,170	38 67	18,127	48,347	1,267,456	56,361	46 62
Delta	38,694	16,827	39 17	83,161	342,667	7,298,814	48,407	46 47
Northwest	108,437	62,216	52 71	133,216	44,588	347,375	4,419,916	54 85
Southwest	114,738	266,761	66 76	11,414,800	346,316	5,740,742	47,307,756	70 18
Texas Western	77,700	78,776	62 61	479,481	3,961,641	12,869,156	24 60	
United	591,411	1,176,776	65 46	11,264,426	26,232,637	166,446,469	61 76	
Western	391,800	819,276	73 73	12,116,207	15,749,233	104,144,893	47 28	
Delta American	5,214,730	1,126,681	64 54	4,540,105	39,381,098	127,774,675	61 18	
Boeing	145,233	172,709	59 86	463,821	6,429,141	81,799,117	97 18	
United World	375,251	71,512	63 34	6,619,203	6,116,814	35,619,234	67 42	
United	99,400	144,617	49 49	1,079,837	709,182	27,142,739	64 62	
LOCAL SERVICE								
Allegiant	391,661	64,942	46 67	66,647	214,757	72,472	6,865,823	42 50
Boeing	133,364	28,819	42 67	10,142	26,719	2,811,307	62 63	
Central	167,738	17,260	39 78	46,615	39,411	3,332,549	26 42	
Frontier	197,993	22,300	50 17	243,420	66,421	6,620,450	49 74	
Lincoln	134,934	21,344	45 26	26,374	147,574	409	2,126,739	37 47
North Central	231,179	68,689	51 63	226,220	241,248	6,779,978	46 41	
Omaha	296,954	48,813	57 62	112,447	89,449	4,916,937	66 46	
Southwest	468,193	97,134	62 37	112,447	144,574	7,448,861	62 48	
Texas	391,028	33,723	46 49	101,342	168,411	3,486,469	49 80	
Westhead	237,244	37,564	49 73	15,516	26,748	161,724	3,910,274	46 24
Texas Texas	239,613	30,164	38 43	141,777	153,490	241,482	8,979,914	56 41
West Coast	214,674	36,134	45 61	47,340	97,059	41,779	3,629,285	50 84
HAZARD								
Boeing	426,289	39,691	39 73	32,791	1,343,070	4,469,119	51 46	
Texas Pacific	267,129	34,666	55 44	11,548	138,173	5,344,446	32 76	
GUARD LINES								
American Submarine	41,176	233,764	59 47	565,167	219,416	67,617,008	16,437,209	72 37
Boeing	41,176	233,764	59 47	565,167	219,416	67,617,008	16,437,209	72 37
Boeing	41,176	233,764	59 47	565,167	219,416	67,617,008	16,437,209	72 37
Boeing	41,176	233,764	59 47	565,167	219,416	67,617,008	16,437,209	72 37
HAZARD								
New York Airways	43,200	813	47 26	12,338	14,848	4,762	969,767	62 37
Los Angeles Airways	26,419	793	46 33	10,031	10,894	148,754	148,754	62 16
Chicago Helicopter	676	14 34	72 23	28,704		36,244	27 21	
HAZARD								
Alaska Airways	43,176	34,322	34 39	437,428	5,421,176	8,746,121	47 94	
Alaska Coast	42,114	4,863	43 66	46,364	46,364	232,692	43 66	
Alaska	42,114	4,863	43 66	46,364	46,364	232,692	43 66	
Alaska	42,114	4,863	43 66	46,364	46,364	232,692	43 66	

* Not available
† Includes 1,365 two miles air surface mail
‡ 11 miles

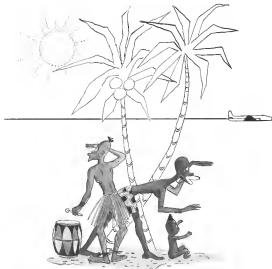
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board

* Not available

† Includes 2,385 tax miles of surface mail

‡ 11 months

Compiled by AVIATION WEEK from weekly reports to the Civil Aeronautics Board



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Passengers on the scheduled air flights of the world last year logged 45 billion miles—enough for one passenger to fly around the equator more than a million and three-quarter times! This figure represents a gain of 14% over total passenger miles flown in 1965. And this amazing record is expected to be broken again in 1967.

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AVIATION PRODUCTS

SHORTLINES

► **Capital Airlines** opened a new office in downtown Minneapolis. Company says telephone facilities are double those in former World Chamber line Airport location.

► **Trans World Airlines** expects a 17% rise this spring over last in traffic. P. Tange, listing the estimate on advance bookings. TWA will schedule 80 transatlantic flights each April 1 will increase the total to 65 by June 1.

► **Qantas Empire Airways** will open new offices in New York in June, and is expanding its East Coast staff. The New York office will include a center for Australian travel.

► **World-wide insurance** policy for air travelers is now available at most major U.S. and Canadian airports through Traveling Co. members and brokers. The air trip insurance covers domestic, foreign segments in single policy.

► **Canadian Pacific Airlines** has ordered \$755,000 electronic flight simulator for DC-6B pilot training. Device will be built in Montreal by Canadian Aviation Electronics Co. for summer, 1957 delivery.

► **Oakland International Airport** projects under bond now recently approved by port commissioners include 51 25-foot twin hangar for jet transports, 24 small plane hangars, its cost \$144,000, and \$588,000 plant to be leased to an engine service company.

► **Ministry of Transport** awarded \$2,430,000 contract for construction of Gatwick Airport terminal building. Aerial complexes super contracts in airport's development plan. Terminal will be 190 ft long and 120 ft high and have direct access to railroad station and main London-Brighton road.

► **San Francisco** won't station field unit has been awarded by the San Francisco Convention, and the survey has been published as a directory for private and business aircraft users.

► **Seattle-Tacoma International Airport** handled 56,375 passengers in November, an increase of 7% over the number handled in November 1955.

► **Trans Australia Airlines'** average daily attendance for its Viscount was 895 hours during a recent 12-month period.

► **Delivery of two Cessna 240s** was made to Trans Texas Airways by the Bobb Company, Inc. Sale was made

AIRLINE OBSERVER

► **Northwest Airlines** will choose either the DC-8 or Boeing 707-120 for its jet fleet, which it wants by 1960, but probably will make no decision until financing problems are solved. Current bank credit of \$19.5 million at 4.75% interest will be absorbed by \$35 million purchase of 16 DC-8s and 34 DC-7Cs, with balance coming from retained earnings, depreciation and sale of four Super Constellation and eight DC-4s. Only U.S. airline that has placed on firm order for turbojet or turbo-prop transport. Northwest does have 21 R4W 775 jet engines on order for 1960 delivery.

► **U.S. Coast of Appeals** has refused to stay a Civil Aeronautics Board order that revokes operating rights of Aero Finance Corp. and Transocean Air Transport. The companies operated service between New York and Miami and Chicago and Miami. Latest CAB decision orders the vagrant carriers to cease operations effective May 1.

► **Robert Tamm**, who recently resigned as vice president sales for Northeast Airlines, is expected to join the Air Transport Assn. as vice president/facilities.

► **Civil Aeronautics Board** has held up its report on the probable cause of the mid-air collision over Grand Cayman last June. Report was about to be released when CAB received word that another person said he had witnessed the accident. Now it will be withheld while the CAB investigators determine whether proceedings should be reopened.

► **British Overseas Airways Corp.** has moved its Middle East headquarters to Istanbul because of the loss in British and French security living over Syria territory. The office probably will return to its original headquarters in Beirut if Syria restores the order.

► **Capital Airlines** last year conducted 2,000 pilot checkouts on all equipment as a result of its Viscount program. Capital's pilot program required progressive training of crews on multiple aircraft to insure full crew coverage of both the Viscount and piston-engine fleets. New Viscount aircraft now being installed and expected to be ready for regular use within two weeks will cut 1956 training costs by 65%.

► **International Civil Aviation Organization** will adopt a convention to study problems of cruise and turbojet aircraft since it was found that there is no internationally recognized system for determining jurisdiction in such cases. The move was prompted by problems, studies of a legal subcommittee of ICAO (AW Dec 17, p. 45).

► **Air Transport Assn.** has inaugurated the Airline Personnel Relations Conference into its organization and elected Joseph L. GFBAN vice president/pasenger relations. GFBAN was previously executive director of the conference, an independent organization.

► **Trans World Airlines** is stepping a program designed to promote tourist traffic in the Middle East. TWA officials in Cairo recently discussed new tourist program with Egypt's Minister of National Guidance and the acting director-general of the Egyptian Tourist Administration.

► **Meineke Air Transport** will lease two DC-4s and two C-46s from Los Angeles Air Service, following recent Civil Aeronautics Board approval. Each DC-4 is being leased for \$17,900 per month. The C-46s carry a monthly rental of \$1,500 each.

► **Air traffic controllers** on protesting against Civil Aeronautics Board ruling that discontinues the requirement for flashing navigation lights on aircraft on the ground. Controllers claim it is easier to follow aircraft using the flashing lights, while CAB officials fear that the lights distract the view of an aircraft's ground path of direction.

► **Air Line Pilots Assn.** has proposed a threatened strike against Pan American World Airways following a second report from the National Mediation Board to delay any action until further mediation is conducted. Pilots ask higher pay and improvement of working conditions, which, they say, involves extensive on-duty time and leave away from home.

6 OUT OF 10 OF ALL THE WORLD'S INTERNATIONAL AIRLINES USE

**KAMAN
HOK-1
SHOWS ITS
MUSCLE**



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HOK-1 general utility helicopters are already in service with the U. S. Navy and Marine Corps where they are used extensively for search and rescue missions, medical evacuation, personnel transport and cargo carrying.

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LIFELINE

*** These are the "call letters" of the U. S. Coast Guard. Watching over more than half a million square miles of our coastal waters, the rescue record of this famous organization is one of the great sea-and-sky sagas of war and peacetime service. Helping to extend the Coast Guard's far-flung lifeline is the Martin PSM and the new PSM-2G, providing long-range sea rescues for any emergency. Also, is active service with both the Atlantic and Pacific fleets of the U. S. Navy, ten squadrons of this famous seaglider—specially armored for anti-submarine warfare—are in operation today, from Norfolk to the Mediterranean and from Washington to the Orient.

MARTIN
BALTIMORE-DENVER-ORLANDO

from a portion of the Constable fleet is currently assigned by Bobb from L.A.I. (John A. Hines in Rome).

► **Nash Airport, Fla.** will be considerably developed at a new mid-airport cut to become a major landing field for trans-Pacific jet airline services from the United States. The decision was made at the Melbourne, Australia, meeting of the South Pacific Air Transport Council.

► **Royal Gull business amphibians** do takeover has been given Royal Aircraft Sales, Inc., General Marshall Field, Milwaukee, Wis., by Tucker Aircraft Corp. (formerly Royal Aircraft Corp.). New outfit will cover Wisconsin, Maine, Iowa, North and South Dakota, Kansas, Missouri and Nebraska.

► **Av France** will install RCA-ANQ-33 weather radar on the ten Lockheed 164RA Constables it has on order. The French airline expects to receive its first 1649 next June.

► **Edmonton Air Service, Edmonton, N. D.** will operate a non-scheduled commercial international air service to Western Canada to include the cities of Victoria, British Columbia, Winnipeg, South Carolina, Saskatchewan, Mexico—Jas. Rogers, Prince Albert, Estevan, Brandon, Calgary, Lethbridge and Medicine Hat. Aircraft are limited by Canadian Air Transport (Route) to types with a dispatch load of less than 1,100 lbs.

► **Net opening** between of All Air Express International and its subsidiary—Air Express International Agency and Starline Freight Transportation—totalled \$2,132,139 in 1955, an increase of 29% over 1954.

► **Reising Aviation Service, Inc., Reading, Pa.** will operate a charter commercial non-scheduled international service from Reading to Montreal, Ottawa, Toronto, North Bay, Mexico and Port of Spain, under license granted by Canadian Air Transport Board.

► **Continental Air Lines** has decided to increase all passenger charges "the current growth period" to help finance its \$62 million expansion program. Future discounts will be in the form of stock rather than cash. Continental has signed a new contract with the United Auto Workers providing for wage increases ranging from nine to 29 cents for 400 employees at the Denver headquarters.

► **Pan American World Airways' Latin American Division** flew 2,771,926 lb. of cargo to Latin America in November, an increase of 364,672 lb. over the total for November 1955.

COCKPIT VIEWPOINT

By Capt. R. C. Rebozo



School Days

In the next several years the airlines will be faced with many large problems concerning the introduction of the new breed of transports. Not the least of these will be the task of training the people who will operate these aircraft. Since these new vehicles are multi-million dollar pieces of precision machinery it behooves management to make certain that training is adequate. Formerly the transition to new equipment, and the training for it, just sort of "grew". Taken step by step, from the era of the DC-3 through the 4s and 6s to the 7s, the change was gradual. Operating personnel had at most one or two new items per plane with which to contend. Now, however, major things are going to appear all at once. The jump will approximate one from a DC-3 to a DC-7. Can you imagine the task of acquainting people with the turbine gas and nose wheel steering, with turbocharged engines and variable propellers, with water injection and pressurized cabins, and all the rest, in one fell swoop?

Things to Come

But, essentially, this is what is going to have to be done in the coming years. In fact, many feel it will be an even greater task than this from the 3 to the 7. Not only will we be faced with a raft of new devices but, in some cases, entirely new principles. This one more complete revision of thought and action in order to change flying habits.

Probably most airlines will use expensive simulators for much of this ground training. This is good. Of even greater importance is the caliber of the instructors.

A competent teacher plan blackboard is of infinitely more value than the most elaborate electronic equipment under computer guidance. For many years the position of ground school instructor has been relegated to the minor leagues, meaning neither the airlines nor the pay that the job deserves and consequently not attracting the highest skilled applicants for the work.

With the coming of jet powered aircraft the job of flight instructor is more than ever in the position of a human mule. He will not be performing as many physical actions—he will be watching automatic gauges. Instead of turning on fuel pumps and mixers and throttles, moving mixture controls and throttles to get under way, he may only move one lever and push one button.

The jet doesn't eliminate everything—it just does things automatically. Except when the automatic fails due to human as yet the breach then a counter measure is required. Unlike the piston engine, however, action is not required in several seconds but is required immediately.

Training Problems

Must use healthy young American male can trace a hydraulic line, or control cable, and understand the workings. Only jets are not hydraulically or electrically controlled. Their machinery is electronic—sometimes a baffling subject for the more young men. This, too, is a problem in training. The tale of electronics will have to be given in the pilot in the language he understands and he must be given the things which are important to his job.

For instance, I can think of thousands of things about a given electronic device that I don't give a hang about. I couldn't use the information even if I understood it.

It might be an overstatement to say that ground training schools need a full Vice-President in Charge of it, but it is a task that some elevating from present status is necessary. Some schools will begin now to gather a competent staff to make that little school room on the corner of the hangar. It is going to become a mighty important place.



Career opportunities for:

Research, Design and Development Engineers

Many new control devices—like the HIG gyro shown on the facing page—are currently being developed by Honeywell Aero. And Honeywell's accelerated development programs call for many more such advanced and challenging projects.

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If you are interested in a career at Honeywell, call us and give yourself to Bruce D. Wood, Technical Director, Dept. TA/B, 1435 Johnson Road, St. Paul, Minnesota 55113, Minn.

Honeywell

AERONAUTICAL DIVISION



Ski-Equipped C-130 Flies

First flight of Lockheed Anasazi Corp.'s C-130 Hercules equipped with 154 ft. main deck was mounted by new through a Forward 100A wide angle lens automatic television camera mounted on 2 ft. diameter Pegasus pod under right wing. The 51,000 lb. plane in wheel-down steep configuration at low speeds also was mounted by T-31 chest plate. Straps on the air for stability at 20 in. screen in cargo compartment. After shutdown, and then wheels and dismounted Right, C-130 will fly the north to Kennedy, Mass., for more landings and takeoffs.



Airport Safety More Important Than Profit

London-British Minister of Civil Aviation says safety and service will have priority over profits at British airports.

Replying to parliamentary criticism that he had failed to cut rising costs at state-owned airports, Harold Wilson says that safety and service must come first.

"If providing these is full measure

means that the operating costs of these airports cannot be for the moment completely recovered by the charges which they can make then I remain completely unconcerned," the Minister stated.

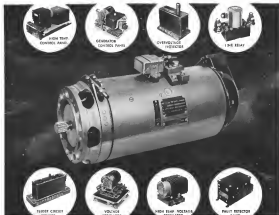
He said Britain is pioneering in all frontier landing devices as well as providing first-class service to the ground for airline passengers.

"That isn't to say that we should not concentrate on a strictly commercial basis both as far as the operation of air transport is concerned and their parent airports," he said. "But I don't



Honeywell Aero's HIG-6, one of the most precise gyros ever designed, is now in quantity production. With a drift rate of less than 0.1 degree, it represents the furthest advance yet made in a production, inertial-type gyro. The HIG-6 is applicable to both full inertial and aided-inertial systems. Standard models of this gyro can be delivered in as little as three months' time.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL



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TYPE NO.	Standard Rating				APPLICABLE SPECIFICATIONS
	AMP.	Output Watts @ 28 VDC	Output @ 28 VDC	Output @ 28 VDC	
2000	10	275-300	2750	28	RED BANK
2500	15	412-450	4125	42	RED BANK
3000	20	550-600	5500	56	RED BANK
3500	25	687-750	6875	70	RED BANK
4000	30	825-900	8250	84	RED BANK
4500	35	962-1050	9620	98	RED BANK
5000	40	1100-1200	11000	112	RED BANK
5500	45	1237-1350	12375	126	RED BANK
6000	50	1375-1500	13750	140	RED BANK
6500	55	1512-1650	15120	154	RED BANK
7000	60	1650-1800	16500	168	RED BANK
7500	65	1787-1950	17875	182	RED BANK
8000	70	1925-2100	19250	196	RED BANK
8500	75	2062-2250	20625	210	RED BANK
9000	80	2200-2400	22000	224	RED BANK
9500	85	2337-2550	23375	238	RED BANK
10000	90	2475-2700	24750	252	RED BANK
10500	95	2612-2850	26125	266	RED BANK
11000	100	2750-3000	27500	280	RED BANK
11500	105	2887-3150	28875	294	RED BANK
12000	110	3025-3300	30250	308	RED BANK
12500	115	3162-3450	31625	322	RED BANK
13000	120	3300-3600	33000	336	RED BANK
13500	125	3437-3750	34375	350	RED BANK
14000	130	3575-3900	35750	364	RED BANK
14500	135	3712-4050	37125	378	RED BANK
15000	140	3850-4200	38500	392	RED BANK
15500	145	3987-4350	39875	406	RED BANK
16000	150	4125-4500	41250	420	RED BANK
16500	155	4262-4650	42625	434	RED BANK
17000	160	4400-4800	44000	448	RED BANK
17500	165	4537-4950	45375	462	RED BANK
18000	170	4675-5100	46750	476	RED BANK
18500	175	4812-5250	48125	490	RED BANK
19000	180	4950-5400	49500	504	RED BANK
19500	185	5087-5550	50875	518	RED BANK
20000	190	5225-5700	52250	532	RED BANK
20500	195	5362-5850	53625	546	RED BANK
21000	200	5500-6000	55000	560	RED BANK
21500	205	5637-6150	56375	574	RED BANK
22000	210	5775-6300	57750	588	RED BANK
22500	215	5912-6450	59125	602	RED BANK
23000	220	6050-6600	60500	616	RED BANK
23500	225	6187-6750	61875	630	RED BANK
24000	230	6325-6900	63250	644	RED BANK
24500	235	6462-7050	64625	658	RED BANK
25000	240	6600-7200	66000	672	RED BANK
25500	245	6737-7350	67375	686	RED BANK
26000	250	6875-7500	68750	700	RED BANK
26500	255	7012-7650	70125	714	RED BANK
27000	260	7150-7800	71500	728	RED BANK
27500	265	7287-7950	72875	742	RED BANK
28000	270	7425-8100	74250	756	RED BANK
28500	275	7562-8250	75625	770	RED BANK
29000	280	7700-8400	77000	784	RED BANK
29500	285	7837-8550	78375	798	RED BANK
30000	290	7975-8700	79750	812	RED BANK
30500	295	8112-8850	81125	826	RED BANK
31000	300	8250-9000	82500	840	RED BANK
31500	305	8387-9150	83875	854	RED BANK
32000	310	8525-9300	85250	868	RED BANK
32500	315	8662-9450	86625	882	RED BANK
33000	320	8800-9600	88000	896	RED BANK
33500	325	8937-9750	89375	910	RED BANK
34000	330	9075-9900	90750	924	RED BANK
34500	335	9212-10050	92125	938	RED BANK
35000	340	9350-10200	93500	952	RED BANK
35500	345	9487-10350	94875	966	RED BANK
36000	350	9625-10500	96250	980	RED BANK
36500	355	9762-10650	97625	994	RED BANK
37000	360	9900-10800	99000	1008	RED BANK
37500	365	10037-10950	100375	1022	RED BANK
38000	370	10175-11100	101750	1036	RED BANK
38500	375	10312-11250	103125	1050	RED BANK
39000	380	10450-11400	104500	1064	RED BANK
39500	385	10587-11550	105875	1078	RED BANK
40000	390	10725-11700	107250	1092	RED BANK
40500	395	10862-11850	108625	1106	RED BANK
41000	400	11000-12000	110000	1120	RED BANK
41500	405	11137-12150	111375	1134	RED BANK
42000	410	11275-12300	112750	1148	RED BANK
42500	415	11412-12450	114125	1162	RED BANK
43000	420	11550-12600	115500	1176	RED BANK
43500	425	11687-12750	116875	1190	RED BANK
44000	430	11825-12900	118250	1204	RED BANK
44500	435	11962-13050	119625	1218	RED BANK
45000	440	12100-13200	121000	1232	RED BANK
45500	445	12237-13350	122375	1246	RED BANK
46000	450	12375-13500	123750	1260	RED BANK
46500	455	12512-13650	125125	1274	RED BANK
47000	460	12650-13800	126500	1288	RED BANK
47500	465	12787-13950	127875	1302	RED BANK
48000	470	12925-14100	129250	1316	RED BANK
48500	475	13062-14250	130625	1330	RED BANK
49000	480	13200-14400	132000	1344	RED BANK
49500	485	13337-14550	133375	1358	RED BANK
50000	490	13475-14700	134750	1372	RED BANK
50500	495	13612-14850	136125	1386	RED BANK
51000	500	13750-15000	137500	1400	RED BANK
51500	505	13887-15150	138875	1414	RED BANK
52000	510	14025-15300	140250	1428	RED BANK
52500	515	14162-15450	141625	1442	RED BANK
53000	520	14300-15600	143000	1456	RED BANK
53500	525	14437-15750	144375	1470	RED BANK
54000	530	14575-15900	145750	1484	RED BANK
54500	535	14712-16050	147125	1498	RED BANK
55000	540	14850-16200	148500	1512	RED BANK
55500	545	14987-16350	149875	1526	RED BANK
56000	550	15125-16500	151250	1540	RED BANK
56500	555	15262-16650	152625	1554	RED BANK
57000	560	15400-16800	154000	1568	RED BANK
57500	565	15537-16950	155375	1582	RED BANK
58000	570	15675-17100	156750	1596	RED BANK
58500	575	15812-17250	158125	1610	RED BANK
59000	580	15950-17400	159500	1624	RED BANK
59500	585	16087-17550	160875	1638	RED BANK
60000	590	16225-17700	162250	1652	RED BANK
60500	595	16362-17850	163625	1666	RED BANK
61000	600	16500-18000	165000	1680	RED BANK
61500	605	16637-18150	166375	1694	RED BANK
62000	610	16775-18300	167750	1708	RED BANK
62500	615	16912-18450	169125	1722	RED BANK
63000	620	17050-18600	170500	1736	RED BANK
63500	625	17187-18750	171875	1750	RED BANK
64000	630	17325-18900	173250	1764	RED BANK
64500	635	17462-19050	174625	1778	RED BANK
65000	640	17600-19200	176000	1792	RED BANK
65500	645	17737-19350	177375	1806	RED BANK
66000	650	17875-19500	178750	1820	RED BANK
66500	655	18012-19650	180125	1834	RED BANK
67000	660	18150-19800	181500	1848	RED BANK
67500	665	18287-19950	182875	1862	RED BANK
68000	670	18425-20100	184250	1876	RED BANK
68500	675	18562-20250	185625	1890	RED BANK
69000	680	18700-20400	187000	1904	RED BANK
69500	685	18837-20550	188375	1918	RED BANK
70000	690	18975-20700	189750	1932	RED BANK
70500	695	19112-20850	191125	1946	RED BANK
71000	700	19250-21000	192500	1960	RED BANK
71500	705	19387-21150	193875	1974	RED BANK
72000	710	19525-21300	195250	1988	RED BANK
72500	715	19662-21450	196625	2002	RED BANK
73000	720	19800-21600	198000	2016	RED BANK
73500	725	19937-21750	199375	2030	RED BANK
74000	730	20075-21900	200750	2044	RED BANK
74500	735	20212-22050	202125	2058	RED BANK
75000	740	20350-22200	203500	2072	RED BANK
75500	745	20487-22350	204875	2086	RED BANK
76000	750	20625-22500	206250	2100	RED BANK
76500	755	20762-22650	207625	2114	RED BANK
77000	760	20900-22800	209000	2128	RED BANK
77500	765	21037-22950	210375	2142	RED BANK
78000	770	21175-23100	211750	2156	RED BANK
78500	775	21312-23250	213125	2170	RED BANK
79000	780	21450-23400	214500	2184	RED BANK
79500	785	21587-23550	215875	2198	RED BANK
80000	790	21725-23700	217250	2212	RED BANK
80500	795	21862-23850	218625	2226	RED BANK
81000	800	22000-24000	220000	2240	RED BANK
81500	805	22137-24150	221375	2254	RED BANK
82000	810	22275-24300	222750	2268	RED BANK
82500	815	22412-24450	224125	2282	RED BANK
83000	820	22550-24600	225500	2296	RED BANK
83500	825	22687-24750	226875	2310	RED BANK
84000	830	22825-24900	228250	2324	RED BANK
84500	835	22962-25050	229625	2338	RED BANK
85000	840	23100-25200	231000	2352	RED BANK



new method solves DIFFICULT R-F NOISE problem

Of course he's relaxed!

Faced with a new version of the same old rf interference vs. space-weight problem, he came upon a solution that sidestepped the usual time, trouble, and expense... by calling on Sprague.

The perfect solution was found almost immediately among the more than four thousand filter designs already available from Sprague.

Even if his problem had required the weeks of research—special measurements and tests—Sprague field consulting service—he would be no less at ease.

With mass production facilities on both the East and West Coasts, deliveries are no problem either.

If you, too, have an interference problem, pick up your phone and call your nearest Sprague Electric Field Engineering Laboratory.

They are located at 32830 Panacea Street, Los Angeles 66, California (TElax 5-7531 or EXmoot 8-2795); 224 Lee Street, Dayton 4, Ohio (ADAm 9188); 327 Marshall Street, North Adams, Massachusetts (MOhawk 3-5311).

see
SPRAGUE
for filters

ing that the engine exhaust control need be kept in full rich position under all operating conditions.

Completion date of the directive is Feb. 25 and as yet test engine is changed at any part of descent or engine shutdown system is altered. Aircraft must be flight checked prior to the completion date at 85% normal rated power in level flight to determine whether fuel consumption is within limits specified by Licensing.

Continental Leases DC-7B to Delta

Continental Air Lines will lease its first Boeing DC-7B, scheduled for Feb. 1, delivery, to Delta Air Lines before putting the plane on its own Los Angeles-Chicago route in April.

The aircraft, according to Continental President Robert F. Six, would have "limited usefulness" until the new route is opened.

The annual lease agreement covering the new plane, one of an order of six, calls for payment by Delta of \$145 per hour of operation, plus additional cost of \$1,450 per day for depreciation and profit. Continental's other four DC-7Bs in the \$11,985,805 order will be delivered during March through July.

The entire DC-7B fleet will be used in the new service, scheduled for April 18 opening, to serve Los Angeles, Denver, Kansas City and Chicago.

KLM Increases Traffic in 1956

KLM Royal Dutch Airlines carried 839,800 passengers worldwide during 1955, an increase of 33%, the carrier reports. Revenue worldwide totaled \$72,346,080 for the year with an average load factor of 62%.

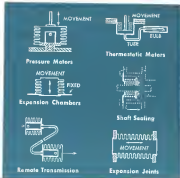
The airline carried 23,600 tons of freight, up from 20,500 tons in 1955. An mail ton was 24%.

Transportation in 1955, as accounted for \$18,000 of the passenger total.

Olympus 6 Completes 150-Hr. Test Run

London-Bristol's Olympus 6 turbo jet thrust its last test before production completion of an officially approved 150-hr type testing run at 18,000 lb thrust.

Observed thrust during the test run reached about 17,800 lb. Further development of the Olympus to three higher power levels is under way. The engine has been stripped for inspection prior to issuance of the official type test certificate.



ELIMINATE DESIGN "WEAK SPOTS" WITH ~~Bellevue~~ SEAMLESS BELLOWS

The simple construction, straightforward operation, and light weight of Bridgeport seamless metal bellows make them the best answer for many temperature, pressure, and mechanical design problems. Hydrofluorically formed without soldered seams, they provide added strength and precision in shaft sealing, in obtaining controlled movement, in absorbing expansion or shock, in maintaining equal or different pressures, and in transmitting motion remotely.

Bridgeport also offers two plus factors to make the most of any bellows application. Through integrated engineering of the bellows and all accessories, Bridgeport can supply complete bellows assemblies of many types, sizes, and metals. Ultra-modern production and quality control facilities assure increased uniformity and cost savings.

SEND FOR BELLOWS BULLETIN-CA



BRIDGEPORT THERMOSTAT DIVISION
MILFORD - CONNECTICUT

FACTS

about

NEW DEPARTURE BALL BEARINGS



AIRCRAFT TURBINE BALL BEARINGS... ENGINEERED FOR PLUS PERFORMANCE



Dependability of performance! That's the keynote of New Departure's specialized ball bearings for fast, high-flying jets!

Leading production jet engines contain the equivalent of one spinner ring turbine aircraft bearings (see page below)—an out-of-date development of New Departure's Aircraft Bearing Research Program. This advance in bearings promises simplified maintenance and assembly with high load-carrying ability at high speeds and temperatures.

New Departure also manufactures aircraft ball bearings for refrigeration turbines, alternator-drive turbines, high-temperature fuel pumps, turbine-driven air compressors, and small gas turbines—all backed by New Departure's research and precision manufacturing.

Use the coupon below for further information about New Departure ball bearings for today's jet aircraft... and what New Departure has in development for tomorrow.

MEDIUM and LARGE TURBINE BEARINGS

DIMENSIONS (INCHES)				
Bore	Inner	O.D.	Width	
6.25	1.2500	9.0000	1.125	
6.50	1.3750	9.6250	1.125	
6.75	1.5000	10.2500	1.125	
7.00	1.6250	10.8750	1.125	
7.25	1.7500	11.5000	1.125	
7.50	1.8750	12.1250	1.125	
7.75	2.0000	12.7500	1.125	
8.00	2.1250	13.3750	1.125	
8.25	2.2500	14.0000	1.125	
8.50	2.3750	14.6250	1.125	
8.75	2.5000	15.2500	1.125	
9.00	2.6250	15.8750	1.125	
9.25	2.7500	16.5000	1.125	
9.50	2.8750	17.1250	1.125	
9.75	3.0000	17.7500	1.125	
10.00	3.1250	18.3750	1.125	
10.25	3.2500	19.0000	1.125	
10.50	3.3750	19.6250	1.125	
10.75	3.5000	20.2500	1.125	
11.00	3.6250	20.8750	1.125	
11.25	3.7500	21.5000	1.125	
11.50	3.8750	22.1250	1.125	
11.75	4.0000	22.7500	1.125	
12.00	4.1250	23.3750	1.125	
12.25	4.2500	24.0000	1.125	
12.50	4.3750	24.6250	1.125	
12.75	4.5000	25.2500	1.125	
13.00	4.6250	25.8750	1.125	
13.25	4.7500	26.5000	1.125	
13.50	4.8750	27.1250	1.125	
13.75	5.0000	27.7500	1.125	
14.00	5.1250	28.3750	1.125	
14.25	5.2500	29.0000	1.125	
14.50	5.3750	29.6250	1.125	
14.75	5.5000	30.2500	1.125	
15.00	5.6250	30.8750	1.125	
15.25	5.7500	31.5000	1.125	
15.50	5.8750	32.1250	1.125	
15.75	6.0000	32.7500	1.125	
16.00	6.1250	33.3750	1.125	
16.25	6.2500	34.0000	1.125	
16.50	6.3750	34.6250	1.125	
16.75	6.5000	35.2500	1.125	
17.00	6.6250	35.8750	1.125	
17.25	6.7500	36.5000	1.125	
17.50	6.8750	37.1250	1.125	
17.75	7.0000	37.7500	1.125	
18.00	7.1250	38.3750	1.125	
18.25	7.2500	39.0000	1.125	
18.50	7.3750	39.6250	1.125	
18.75	7.5000	40.2500	1.125	
19.00	7.6250	40.8750	1.125	
19.25	7.7500	41.5000	1.125	
19.50	7.8750	42.1250	1.125	
19.75	8.0000	42.7500	1.125	
20.00	8.1250	43.3750	1.125	
20.25	8.2500	44.0000	1.125	
20.50	8.3750	44.6250	1.125	
20.75	8.5000	45.2500	1.125	
21.00	8.6250	45.8750	1.125	
21.25	8.7500	46.5000	1.125	
21.50	8.8750	47.1250	1.125	
21.75	9.0000	47.7500	1.125	
22.00	9.1250	48.3750	1.125	
22.25	9.2500	49.0000	1.125	
22.50	9.3750	49.6250	1.125	
22.75	9.5000	50.2500	1.125	
23.00	9.6250	50.8750	1.125	
23.25	9.7500	51.5000	1.125	
23.50	9.8750	52.1250	1.125	
23.75	10.0000	52.7500	1.125	
24.00	10.1250	53.3750	1.125	
24.25	10.2500	54.0000	1.125	
24.50	10.3750	54.6250	1.125	
24.75	10.5000	55.2500	1.125	
25.00	10.6250	55.8750	1.125	
25.25	10.7500	56.5000	1.125	
25.50	10.8750	57.1250	1.125	
25.75	11.0000	57.7500	1.125	
26.00	11.1250	58.3750	1.125	
26.25	11.2500	59.0000	1.125	
26.50	11.3750	59.6250	1.125	
26.75	11.5000	60.2500	1.125	
27.00	11.6250	60.8750	1.125	
27.25	11.7500	61.5000	1.125	
27.50	11.8750	62.1250	1.125	
27.75	12.0000	62.7500	1.125	
28.00	12.1250	63.3750	1.125	
28.25	12.2500	64.0000	1.125	
28.50	12.3750	64.6250	1.125	
28.75	12.5000	65.2500	1.125	
29.00	12.6250	65.8750	1.125	
29.25	12.7500	66.5000	1.125	
29.50	12.8750	67.1250	1.125	
29.75	13.0000	67.7500	1.125	
30.00	13.1250	68.3750	1.125	
30.25	13.2500	69.0000	1.125	
30.50	13.3750	69.6250	1.125	
30.75	13.5000	70.2500	1.125	
31.00	13.6250	70.8750	1.125	
31.25	13.7500	71.5000	1.125	
31.50	13.8750	72.1250	1.125	
31.75	14.0000	72.7500	1.125	
32.00	14.1250	73.3750	1.125	
32.25	14.2500	74.0000	1.125	
32.50	14.3750	74.6250	1.125	
32.75	14.5000	75.2500	1.125	
33.00	14.6250	75.8750	1.125	
33.25	14.7500	76.5000	1.125	
33.50	14.8750	77.1250	1.125	
33.75	15.0000	77.7500	1.125	
34.00	15.1250	78.3750	1.125	
34.25	15.2500	79.0000	1.125	
34.50	15.3750	79.6250	1.125	
34.75	15.5000	80.2500	1.125	
35.00	15.6250	80.8750	1.125	
35.25	15.7500	81.5000	1.125	
35.50	15.8750	82.1250	1.125	
35.75	16.0000	82.7500	1.125	
36.00	16.1250	83.3750	1.125	
36.25	16.2500	84.0000	1.125	
36.50	16.3750	84.6250	1.125	
36.75	16.5000	85.2500	1.125	
37.00	16.6250	85.8750	1.125	
37.25	16.7500	86.5000	1.125	
37.50	16.8750	87.1250	1.125	
37.75	17.0000	87.7500	1.125	
38.00	17.1250	88.3750	1.125	
38.25	17.2500	89.0000	1.125	
38.50	17.3750	89.6250	1.125	
38.75	17.5000	90.2500	1.125	
39.00	17.6250	90.8750	1.125	
39.25	17.7500	91.5000	1.125	
39.50	17.8750	92.1250	1.125	
39.75	18.0000	92.7500	1.125	
40.00	18.1250	93.3750	1.125	
40.25	18.2500	94.0000	1.125	
40.50	18.3750	94.6250	1.125	
40.75	18.5000	95.2500	1.125	
41.00	18.6250	95.8750	1.125	
41.25	18.7500	96.5000	1.125	
41.50	18.8750	97.1250	1.125	
41.75	19.0000	97.7500	1.125	
42.00	19.1250	98.3750	1.125	
42.25	19.2500	99.0000	1.125	
42.50	19.3750	99.6250	1.125	
42.75	19.5000	100.2500	1.125	
43.00	19.6250	100.8750	1.125	
43.25	19.7500	101.5000	1.125	
43.50	19.8750	102.1250	1.125	
43.75	20.0000	102.7500	1.125	
44.00	20.1250	103.3750	1.125	
44.25	20.2500	104.0000	1.125	
44.50	20.3750	104.6250	1.125	
44.75	20.5000	105.2500	1.125	
45.00	20.6250	105.8750	1.125	
45.25	20.7500	106.5000	1.125	
45.50	20.8750	107.1250	1.125	
45.75	21.0000	107.7500	1.125	
46.00	21.1250	108.3750	1.125	
46.25	21.2500	109.0000	1.125	
46.50	21.3750	109.6250	1.125	
46.75	21.5000	110.2500	1.125	
47.00	21.6250	110.8750	1.125	
47.25	21.7500	111.5000	1.125	
47.50	21.8750	112.1250	1.125	
47.75	22.0000	112.7500	1.125	
48.00	22.1250	113.3750	1.125	
48.25	22.2500	114.0000	1.125	
48.50	22.3750	114.6250	1.125	
48.75	22.5000	115.2500	1.125	
49.00	22.6250	115.8750	1.125	
49.25	22.7500	116.5000	1.125	
49.50	22.8750	117.1250	1.125	
49.75	23.0000	117.7500	1.125	
50.00	23.1250	118.3750	1.125	
50.25	23.2500	119.0000	1.125	
50.50	23.3750	119.6250	1.125	
50.75	23.5000	120.2500	1.125	
51.00	23.6250	120.8750	1.125	
51.25	23.7500	121.5000	1.125	
51.50	23.8750	122.1250	1.125	
51.75	24.0000	122.7500	1.125	
52.00	24.1250	123.3750	1.125	
52.25	24.2500	124.0000	1.125	
52.50	24.3750	124.6250	1.125	
52.75	24.5000	125.2500	1.125	
53.00	24.6250	125.8750	1.125	
53.25	24.7500	126.5000	1.125	
53.50	24.8750	127.1250	1.125	
53.75	25.0000	127.7500	1.125	
54.00	25.1250	128.3750	1.125	
54.25	25.2500	129.0000	1.125	
54.50	25.3750	129.6250	1.125	
54.75	25.5000	130.2500	1.125	
55.00	25.6250	130.8750	1.125	
55.25	25.7500	131.5000	1.125	
55.50	25.8750	132.1250	1.125	
55.75	26.0000	132.7500	1.125	
56.00	26.1250	133.3750	1.125	
56.25	26.2500	134.0000	1.125	
56.50	26.3750	134.6250	1.125	
56.75	26.5000	135.2500	1.125	
57.00	26.6250	135.8750	1.125	
57.25	26.7500	136.5000	1.125	
57.50	26.8750	137.1250	1.125	
57.75	27.0000	137.7500	1.125	
58.00	27.1250	138.3750	1.125	
58.25	27.2500	139.0000	1.125	
58.50	27.3750	139.6250	1.125	
58.75	27.5000	140.2500	1.125	
59.00	27.6250	140.8750	1.125	
59.25	27.7500	141.5000	1.125	
59.50	27.8750	142.1250	1.125	
59.75	28.0000	142.7500	1.125	
60.00	28.1250	143.3750	1.125	
60.25	28.2500	144.0000	1.125	
60.50	28.3750	144.6250	1.125	
60.75	28.5000	145.2500	1.125	
61.00	28.6250	145.8750	1.125	
61.25	28.7500	146.5000	1.125	
61.50	28.8750	147.1250	1.125	
61.75	29.0000	147.7500	1.125	
62.00	29.1250	148.3750	1.125	
62.25	29.2500	149.0000	1.125	
62.50	29.3750	149.6250	1.125	
62.75	29.5000	150.2500	1.125	
63.00	29.6250	150.8750	1.125	
63.25	29.7500	151.5000	1.125	
63.50	29.8750	152.1250	1.125	
63.75	30.0000	152.7500	1.125	
64.00	30.1250	153.3750	1.125	
64.25	30.2500	154.0000	1.125	
64.50	30.3750	154.6250	1.125	
64.75	30.5000	155.2500	1.125	
65.00	30.6250	155.8750	1.125	
65.25	30.7500	156.5000	1.125	

Systems Engineers: Engineers put and evaluate electronic analog and biomedical digital computer systems designs for aircraft, evaluate new systems and improvements to bring compliance with qualifications and Air Force requirements. Other assignments include drafting of peripheral equipment, liaison with design, development and test engineers. Do not see below as the trend.



IN WOOD (1941) - E. E. E. 1950. Connecticut, 1800 Customers Engineers, July, 1950, September, 1952, transferred to AEC, Field Engineering, February, 1954, in charge of Field Engineering at Hanford AFB, May, 1955, Nuclear Engineers, supervised Project Engineers, Manager of Systems Evaluation in August, 1956, now investigating a problem in radar data, wood@hawaii.gov, wood@hawaii.gov.

Throughout the length and breadth of the United States IBM has built mainframes, plants and laboratories. The map points out the various locations where you might have an IBM man.

Systems Analysis sets performance and measurement design criteria before and during development of equipment. Later, they compare dynamic performance accuracy and reliability characteristics with what has been anticipated. Other segments include Digital Computer Systems Engineering, Input/Output and Analog/Digital Conversion Engineering. Do you belong in this team?



Maxim Etkovskii (1930-1955, R.S.S.R.)
WFL, 1955-1954. MIT Technical School
graduate in control and automatic computer tech-
niques for transport systems, 1952. Krasnoye
Kavkazskoye responsible for systems design and
analysis, 1954, December, 1955. S. N. Khar-
uzov, responsible for research planning, later
revising setup on laboratory testing some-
times of a somewhat less control problem.

FOOTNOTES AND REFERENCES

B. A. Whitcomb
Manager of Engineering Recruitment, Dept. 3202
International Business Machines Corp.
380 Madison Ave., New York 17, N. Y.



MILITARY PRODUCTS



Leading-gate strut for the North American F400C is manufactured by Bendix Products Division, Bendix Aviation Corporation. Exceeding requirements for inner and outer cylinders resulted in the development of a new grade of steel by Bendix and Republic Metals/Burgin, Inc. In cooperation with North American customers,



How Metallurgical Teamwork Developed the Super Sabre's Tough,

When a new grade of steel is born, there's sure to be an incentive story behind it.

In this case, it's the story of close cooperation between metallurgical teams from Bendix and Republic. Their common goal: development of a tough, strong, alloy steel to withstand the shock, impact, strain and vibration of tons of aircraft hitting the runway at speeds in excess of 180 miles per hour.

It starts after World War II, when Bendix metallurgists undertook a program to correct certain characteristics and improve processing deficiencies

Several leading steel companies, including Republic, were consulted and the program outlined. Republic immediately put its 3-Division Metallurgical Service Team on the problem.

The field metallurgist worked closely with Bendix metallurgists and engineers right in their own plant under actual operating conditions. Their findings were supplemented and coordinated by the other two members of the Republic team—the laboratory and mill metallurgists.

The result, development of a new grade of steel that

Strong, Alloy Steel Landing Gear

was found ideal for application in the strength range of 220,000-260,000 psi. This steel, designated AMS 6437 by the SAE, offers maximum resistance to fatigue. Provides an exceptionally high strength-to-weight ratio. Maintains its great strength at wide temperature extremes. Responds uniformly to heat treatment, producing hard, wear-resistant surfaces second to none.

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Mr. J. W. Laroche, Asst. Chief Engineer
Dept. A-2

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Firebird

Navy's new KDA (USAF Q-3A) Firebird is expected soon extend their pilot of Navy F-2V, making them. The 1,300 lb. Firebird is capable of a speed of Mach 2.9 and a range of 770 mi. Development is a Standard J44-B-20 turbojet developing 1,800 h.p. thrust at sea level.

In the first edition of the book, "Relating on the records of the great Russian scholars, Leonardo and Mendeleev and on Krasovskiy, the creator of the world's first helicopter, Mozhaisky undertook solution of the problem of building a heavier-than-air apparatus."

But how is it possible to place Leonardo and Mendeleev alongside the clock from Russia (Krasovskiy), whose very existence has been placed in doubt by leading scholars? Just how is it possible to build an airplane by drawing from experience obtained in sailing a balloon?

Two-Cylinder Engine

On page 21 of the first edition it is alleged that in 1879 Mozhaisky designed and built a two-cylinder internal combustion engine. To support this statement a distorted quotation from references made by the chief members of the Navy is cited. Actually the document that is quoted refers to a reference not to Mozhaisky's engine, but to one built by Stephen Mozhaisky only linked into the problem of wing stress in engine as an airplane.

At the end of the book, on page 28, it is alleged that Mozhaisky's two engines were in every way more advanced than the internal combustion engine developed 20 years later by the Wright brothers. This is completely contrary to the facts.

In the collected works of the Military Publishing House titled "For the Honor of the Fatherland's Science and Technology" (published in 1948 and one plan by I. S. Savelov and I. Shapovalov) it is stated that the Russian Russian designer A. F. Mozhaisky, concerned of the idea of winging airplane wings and in control systems (modern for local at birth). Actually Mozhaisky didn't in test other wing winging or aircraft.

In the collected works it is alleged that the patent issued to A. F. Mozhaisky in 1881 was the world's first for an airplane, whereas the Englishman Henson and others of his country were concerned such a patent as early as 1842.

In an article written by I. S. Shapovalov in the No. 5, 1952, issue of the "Air Force Journal," it is reported that Mozhaisky's airplane "repeatedly" rose into the air between 1887 and 1889, and that it flew at a speed of 37 feet per second.

Actually the old publications cited to support these statements referred to a model plane which was actually was taken off at a speed of about 15 kilometers per hour.

The article was that the planes of Mozhaisky and Adler "could not and did not rise into the air," although these airplanes were officially established the first in 1884 and the second in 1897.

Errors and Distortions

Many errors and distortions were also tolerated in I. F. Shapovalov's brochure titled "The Outstanding Russian Aviator F. N. Nostrov" (Military Publishing House, 1952). On page 5 of the brochure it is stated that Nostrov designed plans a fighter plane.

But even the size of fighter aircraft didn't exist at that time. The design of Nostrov's plane differed from other designs in the field of a new control arrangement (there were no vertical rudders).

On the very same page it says that thanks to Nostrov, Russian fliers were the first to master such figures in the "vertical turn and the wingover." Nostrov didn't make such figures and could not make them in the airplane which he flew in 1913.

On page 53, the possible flight trajectories worked out by N. Zhukovsky are

A Vought Vignette FIRST IN A NEW SERIES



The Aircraft Designer Who Went to Sea...

IT WAS A NOTORIOUS CRISIS for the *Ron Moore Richard* but for Wayne Baruch, it was a memorable climax to months of hard work. Aboard the carrier with the Chance Vought design specialist was the white-knuckled fighter he'd worked on so long.

Wayne had joined the Crusader daylight project in Preliminary Design, on skimming and skimming gear. David Thompson had skinned drawings into detail design and, later, he'd watched his gun pass the and aircraft deep tests. At the Navy Test Center, the Crusader's gear absorbed maximum tank speeds and twisting tension, and Baruch once more was there.

Now, Navy pilots on the *Ron Moore Richard* were taking the Crusader to sea, and Baruch was going along. This time his assignment was simply to watch, and this time the Crusader was to be put part of the picture. Vought wanted him to experience carrier life and to see how his new weapon fitted in. For Wayne, whose car lay behind and ended with one day's flying from a 30-foot launch, it promised to be an eye-opening voyage.

For six days the designer shared quarters with Navy fighter pilots and had coffee with maintenance men. He studied aircraft spotting and catapulting, and he learned the sign language of the LSO (Landing Signal Officer). He marveled at the lightning turning of the Navy's deck handlers and at the *Ron Moore Richard's* mid-voyage refueling of two bobbing destroyers.

Wayne calls it "one of the most enjoyable weeks of my life"—and, at other sea-going Vought engineers have discovered, "one of the most profitable, too."

"Now I know the pilot's job, what maintenance wants—how really big the operation is. It's something you don't get if you stick too close to design. 'I guess you'd call a perspective.'"

At Chance Vought the designer steps in touch with his product. Contact begins in development, extends through test and production, where possible, a study by the designer of the technical environment in which his weapon will serve.

CHANCE VOUGHT AIRCRAFT
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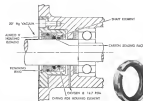


Fig. 1 - Magnetic shaft seal isolates rear support of shafted element from 20" Hg vacuum. Element separates forward - no leakage is required.

Effective Sealing of Oxygen Against Vacuum Accomplished by Magnetics

Gas leakage eliminated, despite extreme pressure differential — 20" Hg to 14.7 psia.

by E. A. Steves

Isolating gas at atmospheric pressure from a high vacuum is a problem which puts a shaft seal to ultimate test. It calls for the highest degree of reliability over long operating periods.

Further, though usually less critical problems arise in handling gases of all kinds. The seal's protective material attracts a thin gas-vacuum seal-type of seal less effective after very short operating periods.

By applying magnetics to this problem, designers have come up with an effective solution (Fig. 1). Magnetic attraction between shaft element and housing element, evenly distributed around the circumference, provides even sealing force, immediate effective resealing, and prolonged life on the seal "seals" it.

Operating Principle (Fig. 2)

A magnetized ring of Alloy V, with an O-ring gasket on its outer surface,



Fig. 2 - Operating principle

magnetic seal corp.



Fig. 3 - 20" Hg pressure magnetic seal

Fig. 4 - 20" Hg pressure magnetic seal

It is many times longer than the life of the shaft.

It is more important in design and lighter in weight than any conventional seal.

The earliest sealing face is self-healing — runs cool and wears slowly.

Typical Application of Magnetic Shaft Seal (Fig. 1)

Lewis Bros., Inc., of Newark, N.J., manufacturers of air pumps, was requested to build a pump with pure oxygen at atmospheric pressure on one side and 20" Hg vacuum on the other side. The shaft sealing problem could be dry contact between shaft seal and housing owing to the possibility of explosion that use of a lubricant would present.

No conventional seal could be found that would function in this critical application without leakage.

However, a magnetic seal was designed that proved to be the ideal solution. It formed a reliable seal for 100,000 operating hours. There was no need for lubricant since the carbon face is self-healing. The successful design also included a gasket so that the seal could be applied to pumps that were already in use in the field.

Magnetic Shaft Seal Specifications

Model	Size
Model 100 (1" dia.)	1" dia.
Model 200 (2" dia.)	2" dia.
Model 300 (3" dia.)	3" dia.
Model 400 (4" dia.)	4" dia.
Model 500 (5" dia.)	5" dia.
Model 600 (6" dia.)	6" dia.
Model 700 (7" dia.)	7" dia.
Model 800 (8" dia.)	8" dia.
Model 900 (9" dia.)	9" dia.
Model 1000 (10" dia.)	10" dia.

Additional Technical Information Is Available.

Send for complete literature on magnetic shaft seal.



50 WARD ROAD
BELLINGHAM, N.Y.

with two conductors on his cap, the single beveled piston ring on his chest, and a single beveled piston without beveled pistons and a slanting collar.

The reader also finds many amusing statements in the reference book "Dates in the History of the Automobile's Avances and Amusements" published by the Voluntary Society for Cognoscence With the Armed Forces in 1915 (see also—L. Shostakov, editor—T. Kuznetsov). Such a book has been needed for a long time. But it comes out with a multitude of errors and some more, at the same time, has no source references, which are indispensable for a reference publication of this type.

Lomomov's Myth

We will cite several examples. On page 9 it says that "The source of the development of modern jet engines stemmed from the Rocket Institute" established in Moscow in 1908-10. Further down the same page it says that "the propeller blades on the hub engine model invented by M. V. Lomomov were similar in form to the blades of vortices, and the engine was called 'vortex engine'." Page 11 once shows a drawing of Lomomov's model. Yet the design of Lomomov's model, in fact, was based on a jet engine.

The drawing is a fairly crude jet engine model. The very first Lomomov built and tested this model on June 12, 1914. Develinking the fact that the model could not have been built and tested on one and the same day, the date itself is not correct. The date itself was in July, not in June.

On page 21, where reference is made to M. T. Lomomov's flight to an altitude of 5000 meters, the most important point is omitted. At this height the balloon burst due to expansion of the gas. But Lomomov was able to descend safely, using pieces of the balloon's bag as a parachute.

French First

On the same page it says that in 1925 A. P. Mozhaysky was the first person in the world to make an ascent in a light aircraft. Mozhaysky began his ascents in a biplane in 1917. But this was done in France and earlier, in 1917, by Le Bris.

On page 26 there is no mention of Lomomov's very interesting flights over the sea in 1919 or of A. P. Mozhaysky's presentation of an application for issuance of a patent on his airplane. It is stated that the first flight by the Wright brothers in 1903 lasted two seconds when, as a matter of fact, the first flight lasted 16 seconds and on later flights the very same day the endurance reached 59 seconds.

The reference book points over the fact that Mozhaysky's models were done

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Latest Lansen

Sweden's L-128 Lansen intercepter is latest version of two-seater delta-wing design. L-128A was struck, crashed and is in service and production. These images along with the L-128 design, Lansen's Delta-Epsilon area produced under license in Sweden with alterations designed and developed by Royal Swedish Air Board and Svenska Flygplan; new and powerful maneuvering engine lighting, new navigation and fire control equipment. Lansen is built by Sella Aircraft Company, makers of the double-delta wing L-15 intercepter.

contributed in 1985 to the Russian Technical Society. This mission was especially ironic because that fact relates the possibility of an airplane flight (by Moskvich) in 1935.

On page 28 the date is incorrectly given for the first test flight of Russian military aircraft. The start of K. E. Tikhonov's work on the S-101 of aerodynamics is dated two years earlier than it should be. Moreover, A. B. Baid's experiments with models equipped with rocket engines is omitted.

Skis Tested

The reference book asserts that in 1917 "for the first time in the world," N. Lobanov's ski was tested for airplane takeoffs from snow. Yet as early as 1909 the Russian aviation hero Y. K. Zhukovskiy took off from the snow on skis, and in 1910-1911 takeoffs on skis were made at the Sevastopol Aviation School.

On page 77 nothing is said about operations at the Moscow Aviation School's main training center for Soviet aviation cadets—about the very important experimental flights made by Professor V. P. Vichukin. Nothing is said about the operations in March 1925, of the first detachment of Soviet "Mikoyan" war planes.

On page 92 all of the figures regarding the first airline between Moscow and Nizhny Novgorod are incorrect. Granted, air such tests as the opening of the Armed Gunners and Bombing School and the testing of the first Soviet two-engine plane—the "Klimov-1."

Enumeration of the countless errors and omissions in "Dates in the History of the Fatherland's Aviation and Aeronautics" could be continued. They appear on almost every page. But what has been mentioned is sufficient to

realize that this reference book can only lead the reader astray.

Unfortunately, our press not only has failed to notice all these errors but has heaped lavish praise on the above-mentioned books. Yu. Andreyev, editor of the book, written by Shapovalov and Cherenyaykh (second edition), published a "foreword" on the book at the magazine "Tekhnika Molodezhi" (Technique for Youth) although he, along with the authors, bears the responsibility for its errors.

Yermolai Vozdvyazhnyy Flot' (The Force Journal), "Krylia Rodiny" (Wings of the Fatherland), which is the magazine of the Voluntary Society for Cooperation With the Armed Forces, and the newspaper "Red Star" (official organ of the USSR Ministry of Defense) refused to publish a critical review of the Shapovalov-Cherenyaykh book.

This critical review was written by members of the Section for Propaganda the History of Aviation and Aeronautics.

Not Criticized

Not one of the books listed above was subjected to criticism in the press. This led to a situation where the mistakes made by Shapovalov, Cherenyaykh and Shapovalov are being repeated in other publications.

Thus, for example, most of the errors in the "Aviation" "Dok. Gosizdat" for 1954 appear the errors in Shostakovskiy's book "Dates in the History of the Fatherland's Aviation and Aeronautics."

G. Lepenskiy's book "From Vostok," published in 1954 in Moscow, contains both the history of Moskvich's airplane as Cherenyaykh and Shapovalov have told it.

The forewords which Cherenyaykh and Shapovalov put in circulation have been repeated in 1956 by the authors of many other articles and books, even including school textbooks on physics.

Just who are such departed books not criticized in the press? It is because the authors of these books took on the editorial boards of aviation publications. I. Shapovalov is the assistant editor of "Air Force Journal" and is a member of the editorial board of the magazine "Wings of the Fatherland." His co-author B. Smolov, an editor of "Wings of the Fatherland," N. Cherenyaykh is chief of the editorial publishing department of the Air Force.

Taking advantage of their official positions, these people support each other very, very so that each other's books are mutually reviewed, and they by publication of critical articles and verdicts by other authors.

It is necessary to terminate this conspiracy, to sustain the public's role in discussing aeronautics and aviation being prepared for publication, to fight against all kinds of fabrications and fabrications and to produce good books on aviation history.

Republic Contracts for Wind Tunnel Facility

Fanshigle, N. Y.—Republic Aviation has signed a contract for the design of a new million-dollar wind tunnel facility to aid in designing aircraft.

Murphy J. Pease, president of Republic, says that the design contract will be awarded to the firm of H. J. Kopp, president and construction firm, amounting to approximately \$200,000.

He said it will for detail design and

engineers:



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Removal operation of Avionics Audiotape DC-58 which sank through deteriorated concrete at Pueblo Airport was aided by plastic bags flown from the Denver Naval Air Station. Bags were inflated under vacuum to lift wreckage from bag.

supervision of construction of two towers, in one of which models of proposed aircraft can be tested at Mach 4, or four times the speed of sound which is 760 mph at sea level.

The tunnel ducts will be located in a building 72 ft. by 32 ft. at the company's main plant in Fairview. There will be two tunnels of the same different blow-down type, one transverse

and the other transverse. They will be located in the one building.

The supersonic tunnel will permit Republic scientists to experiment with aircraft in flight at speeds up to Mach 4. The tunnel ducts will be capable of testing models at Mach 3.5 to 4.4. The facility will be designed so that the capacity of either tunnel can be expanded readily.

gates and machine specialists. But present flying instruction and training is the war of maneuver and maneuvering under varying combat conditions must be provided.

There have been times, Red Star declared, when certain flying groups have failed to pay necessary attention to tactical training. Consequently, during flying instruction the students often act in a stereotyped fashion.

They are not above able to evaluate correctly a situation that develops in the air and therefore, can't make a proper decision.

"Basic for this current defense is student training must be basic primarily be the flight and tactics instruction. Not all of these instructors are concerned about understanding 14 their students such qualities as independence and initiative in choosing tactical procedures."

"This doesn't emphasize the need for daring and tenacity in carrying out various decisions."

"It has been shown that some instruction teaches their students without taking into consideration the numerous changes which have been made in combat methods during some years in military development as ground and aviation technology is particular."

Red Star demanded that students get more training during warlike exercises, especially under difficult weather conditions. It called on training agencies

Red Air Force Training Schools Accused of Instruction Deficiencies

Results has changed that several of its air force training activities are failing to give their students well-rounded instruction. Even worse, Soviet military chiefs complain, is the lack of initiative other apparent in young officers who have put little in "military protective" flying school environment.

According to Red Star, official organs of the USSR Ministry of Defense, some air force training school commanders "consequently believe, they have fulfilled their responsibility by teaching the students memorized theory. They seem to think their graduates will get all the practical flight training they need after assignment to an air base unit."

As a result of this attitude, the paper explained, newly commissioned flight

officers can gladly tell all about the location and design of various aircraft and engine parts and components "But when it comes to actual flying, they don't do well."

Red Star said that as other student flying groups of the Khabarovsk Aviation Academy found this is just such as "untenable" position.

"The students in the group were well qualified with regard to their knowledge of an aircraft's structural parts. They also understood flight theory. Yet they made a poor showing when it came to diagnosing problems of aerodynamics and operation of equipment in the air and on the ground."

Of course, theoretical studies must be given as important place in the program for training fighter pilots and



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Packard Electric

Where, Glen 
"Line 'F' division of General Motors"

communities to stop being "accidental inventors" and consciously pursue use of their studies.

Such a tendency also deprives teachers of authority. There isn't any authority where student pilots, circa at the end of their instruction, were not allowed to make a single takeoff or landing without pumping from the flight leader.

Miles M-100 May Fit Army Support Role

London—U. S. Army has expressed interest in a new jet trainer designed by F. G. Miles Ltd. which is due for its first flight in Shertenkham airport early in March.

Army officials say the M-100 Student (AWW Aug. 29, 1955, p. 75) might fill an Army requirement for a ground support aircraft.

First prototype of the jet trainer, which is designed for either one or two jet engines mounted aft of the pilot, will be equipped with a single Fairbanks-Morse. The second prototype will have either a Mustang or two P-51 engines.

Third prototype is to have a light weight Rolls-Royce engine now under development which would increase its performance by 100 mph.

Initial cost of \$16,400 including engine is half that of Britain's only other basic jet trainer, according to Miles.

The jet trainer is based on a production of 200 aircraft.

Delivery could begin within 18 months of placing an order, it is estimated.

Sperry Starts New Armament Divisions

Lake Success, N. Y.—Sperry Corp. scope Co. will establish two new divisions—Air Armament Division and Surface Armament Division.

New divisions will conduct engineering and manufacturing activities at Sperry's Lake Success plant, with engineering facilities being scattered near Long Island and other sections of the country.

Samuel Agoston, former vice president, was named manager of the Air Armament Division and Myron D. Lockwood, former engineering director of surface systems, was named manager of the Surface Armament Division.

Guided missile projects will be among the development and production assignments of the new groups.

Critical Air Report Studied by Ministry

London—Parliamentary report is critical, criticizing government methods of military aircraft procurement in a long study issued by Britain's Ministry of Supply.

That information was given to the House of Commons by Supply Minister Anthony Jones, who indicated he was having a letter statement to submit on the subject.

Jones had been pressed from the back benches to explain what action he is taking to expedite recommendations of the House Select Committee on Estimates, which called for a complete overhaul of procurement procedures.



New Marine Copter

First of new U. S. Marine Corps HUS helicopter, development of Sikorski H-48, is scheduled for flight delivery to Marine Corps Air Facility at Santa Ana. Child. Chapter is 12 passenger usually capable of having twelve payload. It powered by Lycoming-built Wright R-1512. It has automatic stabilization, rotor controls for troops or supply versus hoist and external cargo slings.



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A3D Modified as Tanker

Douglas Aircraft Co. is converting A3D Skyraider two jet bombers to extra-fuel aerial tankers. Flight Refueling, Inc., Baltimore, Md., was awarded a \$2 million contract by Douglas for design and production of the four jet modifications for the A3D to complete the probe and design system already in Navy use. Tanker unit will be essentially complete at start while the leads by except for a power source and engine controls. Ref, hose, design and design line are in full force for modification with large fuel tanks in the back bay.

methods (AW Jan 28, p. 20).

"Some of the recommendations of the report are verifications of the idea, with which nobody would quarrel," Jones said. "Of course it would be wrong to overhaul the aircraft industry, but the question of perfect judgment whether this or that idea is feasible

is quite different. That can be decided upon only after much more detailed investigation."

One member asked the supply minister what steps he was taking to cut down the disproportionate number of helicopter projects reported by the committee.

"The committee... about the helicopter projects relate mainly to the program as it was some time ago," Jones replied. He said that at present only four helicopters are under development.

When a questioner demanded to know whether perfect committees now

are being made in the committee, Jones answered, "In order that that digest of intelligence after only a week or eight, would be rather too much to expect."

Although only four helicopters are under development he said the justification for expenditure in those four will have to be looked at in the light of the defense program that will be outlined in the forthcoming defense White Paper.

This is expected to call for a considerable cutback in Britain's military commitments.

Super Accelerator to Be Installed at Redstone

Huntsville, Ala.—A Zimmon-Van de Graaff particle accelerator for low-energy electron and photon research related to guided missiles and safety will be installed at the U.S. Army Ordnance Corp.'s Redstone Arsenal.

Built by High Voltage Engineering Corp., Birmingham, Ala., the machine will be used in the Redstone Research Laboratories, part of the facility's extensive Ordnance Missile Laboratories. Programs relating the Van de Graaff as well as other specialized equipment are under direction of Dr. Eugene Miller and James E. Norman, chief and deputy chief respectively of the Research Laboratories.

Greer Hydraulics Awarded AF Contract

New York—Greer Hydraulics Inc., New York International Airport, was awarded an Air Force contract for \$1,714,219.

The contract is for installation of propeller governor test stand to test the performance and operating characteristics of electric and hydraulic propeller governors in operating conditions encountered in actual flight.



No Hands

One man, rocket-powered helicopter is guided to one by down "no hands" recently made its first public flight demonstration in Philadelphia. Manufactured by Solent Aircraft Corp., winged aircraft's good stability and maneuverability is provided by gyro optics. Weighing only 230 lb empty, 540 lb in flight, cockpit has rocket engine mounted in rear of rotor blades. Fuel of 100% kerosene is stored in spherical fuel tanks at pilot's side.

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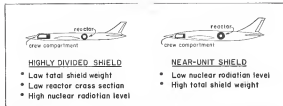
COAST DIV.

NEW YORK DIV.

NEW YORK, N.Y.

NEW YORK DIV.

NEW YORK, N.Y.



HIGHLY divided shield for steam-powered weapon system allows thinner fuselage skin (left) than near-unit shield (right)

Materials Problems Result From New Environments

By George L. Christian

New York—There are operational environments now being considered for missiles and other aircraft aircrews consisting of a series of stressors: aerodynamic heating—Sea surface temperatures of 10,000° associated with missile entry into the earth's atmosphere are deadly in sight. This is at least double the highest melting point (graphite dissolves) slightly over 6,000°) of any material known that

would be suitable in armor fabrication. • High sonic intensities—noise pressure of 110 decibels has a cyclic wave damage to structures in such aircraft as the McDonnell F-101 Voodoo fighter and the Boeing B-52 Stratofortress heavy bomber. • Nuclear radiation—the threshold of radiation damage to a whole group of very critical aircraft materials is about 10¹⁸ gamma photons/cm². It will be difficult to armor modern or nuclear-powered weapon systems (such as the WS-275A) to this level because of the

large amounts of very heavy shielding required around the reactor.

These three new and challenging operational environments affect in a way unprecedented in an aircraft—its structure and propellant, its systems, its lubricants and fluids, and its various life-support materials.

The dependence of weapon systems development on materials development was emphasized by Major Patrick C. King at a materials session of the 1968 Institute of Aeronautical Sciences meeting.

He said, "For any weapon system design undertaken, the key to successful progress will be the materials of construction." Major King is in the Equipment and Materials Development, Acquisition, Air Research and Development Command, USAF.

Heat Menace

Three principal sources of heat in supersonic aircraft are aerodynamic phenomena, the propellant and the propellant. Temperatures generated by the first two are increasing as speeds rise and power grows. Engine heat input at 10,000 ft is being held in check by the increasing use of cool operating materials in place of heat-generating vacuum tubes.

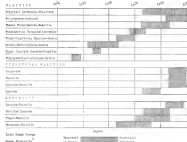
To date, the increasing heat in aircraft has been looked at as a serious liability because heat tends to rapidly dissipate. But, as speeds continue to climb, heat may turn into a productive asset. For instance, it may be possible to use the high heat loadings required by hypersonic boundary layers for propulsion.

Three solutions to increasing heating are:

- Heat-resistant materials such as cer-



CURVES show that by using a near shield radiation effects would be minimized, but the aircraft would not be too extreme left total shielding weight goes to 250,000 lb. At point of minimum shield weight, nuclear effects would be high.



amics, composites and intermetallics. But these materials present serious drawbacks to refractive and opaque materials because their thermal shock resistance is relatively low. Since most thermal shock data is cyclic, engineering considerable theoretical refinement will be necessary to solve problems associated with this phenomenon.

Insulation plays a very important part in the overall gross physical properties of these materials and are linked with the problems of latent, moisture and interdiffusion. Studies must be initiated to determine the effects of exposures in these highly heat resistant materials, and fundamental solid state physics theory must be applied to these problems.

Carbon deposits, its main structural disadvantages, steady state is a high temperature material. • Insulation materials to protect sensitive components from excessive heat. Refractive oxides present low thermal resistance material in insulation. Recent developments point to active insulation methods. A thin film (10-100 in.) of amorphous carbon deposited on a metal surface can reduce the heat transfer rate by a factor of five.

Preferred insulations of refractory materials use multi-layered structures in heat conductors.

Heat reflection from surfaces has only recently been considered for exposure in an insulating method.

Considering these principles only an extension of present aircraft fabrication techniques—use of transistors and heat-resistant structures—may provide significant advances in this field.

• Cooling systems to reduce excessive heat. Their progress has been slow, but recent breakthroughs



THE TWO CHARTS (above) show radiation effects on a number of important aircraft materials such as plastics, structural glasses, adhesives, gaskets, weapon fuels and lubricants, etc.

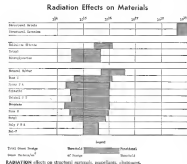
Regenerative cooling has long been used to cool liquid rocket engines. Recent developments in fabricating techniques promise significant advances. It also holds out the very attractive possibility of using for thrust heating for propellant preparation.

• Transpiration cooling is not new but mechanisms for accomplishing this job need considerable development, or cooling to ARJC operations.

Diffusion cooling is a new cooling concept which derives from the greater ability of liquid hydrogen to diffuse through some metals. The thermodynamic properties of liquid hydrogen are attractive for cooling nuclear

Materials & Outer Space

In satellite and space travel, passive materials problems arise. Because of the lack of an atmosphere at extremely



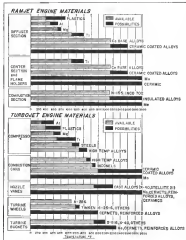


CHART shows heat resistance of various engine jet and fueljet materials.

high aluminides, currently become the primary method of heat transfer of a material (generosity is a material's capability to radiate energy when hot). Because of the growing importance of a material's emissivity, programs are under way to determine emissivity values for nearly all aircraft structural materials.

At extreme aluminides, the surfaces of a vehicle exposed to solar energy, because furnace hot, those away from the sun aluminides will. Destructive oxidizing could be combatted by using an opaque vapor between the boundary layer and the aluminide to continuously reduce surface heat transfer.

The cold surfaces create problems regarding application of cryogenic technology—the technology of temperatures approaching absolute zero (—273°).

If C. Sullivan of the Materials Laboratory, Wright Air Development Center, pointed out his paper, "Materials Approach to Advanced Winged Systems," that says:

"Currently some design concepts will change because, in engine applications, aluminide performance is limited by the physical properties of materials and the natural environment.

Because, all this, the future will require materials capable working closely with design engineers to that new environmental conditions can be met with new processes and new phenomena that will enable materials to advance progress rather than to limit it.

"Materials development is entering a new phase where good physical properties must be integrated with proper design and phenomena associated with molecular and atomic structure."

The most perplexing structural problem are closely associated with heat according to ARDC spokesmen.

Aluminum alloys and widely have been used in aircraft materials. The Bell X-2, which flew 1,900 mph, had aluminum skin wings and tail mounted on a K-Maxwell engine.

There has been considerable debate about the relative merits of titanium alloys and titanium alloys for surface use in the 3000° heat temperature range. ARDC spokesmen state that currently it appears more recently developed titanium alloys than 6Al-4V may be slightly superior to such alloys, such as 17-7PH, from a strength-weight point of view.

However, steel alloys become increasingly superior to present titanium alloys at temperatures exceeding 1800°. Fatigue and creep properties of metals are also important considerations for an aircraft designer.

Research Logging

Research in fatigue seems to be lagging behind materials development and is one of the most perplexing and demanding research in modern design and performance of today's aircraft. The superposition of noise and high test pressures upon normal vibration causes of fatigue damage has made it difficult to solve the problem for materials scientists and development engineers.

Creep—the slow expansion or contraction of a solid under a steady load—may be the determining factor of its plastic aircraft strength. This phenomenon can cause failure of structures well below those considered to be the safe operating loads. The fundamental aspects of creep are still not clearly known.

It is known, however, that creep is accelerated by long exposure to a load at high temperatures. One of the most serious alloys now used is susceptible to 700°F is that rapid drop in creep strength above this temperature.

Other titanium alloys used by ARDC spokesmen are susceptible to embrittlement, weldability and a problem, and then give their steel alloys. Effect of the latter phenomenon is indicated by the fact that over 10,000 lb of titanium is being used in the construction of the X-15's nose. Much (about 85%) of this titanium is 6061 sheet. This heavy-gauge sheet is being used in a stress-critical position because lighter-gauge, weldable sheet is not available. Despite titanium handling of titanium alloys now under development may help solve this problem.

Other potential 1200°F materials are the martensitic stainless steels and the coated low alloy steels. Most problems of the former is their formability.

Protective coatings against oxidation and corrosion which possess thermal, mechanical and corrosion resistance are a prime requirement. If these coatings with these qualities were available, they would make it possible to use many materials at temperatures up to 2500°F. This is particularly true of metal-matrix alloys which retain their

strength but are extremely susceptible to oxidation at these temperatures.

Most problems of aircraft performance materials are quite similar to those associated with the aircraft.

Lubricants and Hydraulic Fluids

An ARDC officer had this to say about lubricants and hydraulic fluids which must operate in the extreme limits of extreme heat and under such loads. When the environment to which these lubricants will operate is considered, it becomes clear that radical changes must take place in our present thinking with regard to engine oil and hydraulic fluids.

"We must develop totally different lubricants if we are to solve the lubrication problems of the future."

The Air Force puts prime importance on fluids and lubricants having thermal stability at temperatures of 700°. The importance of obtaining this goal is such that the service, in willing to rely on low temperature requirements for fluids (currently at —50°F) to gain improvements at the high temperature end of the scale.

Also lubricants and fluids must be able to operate satisfactorily in a vacuum environment.

Research developments in engine lubricants include chlorinated, ester, ester and alcohols. These are being studied for use in engines with a

boiler at temperatures of 1600° bearing temperatures of 700° and hot spot temperatures of 850° F.

Among other concepts, heat exchanger techniques being investigated by the Air Force is using the properties of certain materials to react at high temperatures and provide a low lubricating film for lubrication bearing.

Hydraulic fluids in the aircraft category of aircraft with ability to have an unlimited temperature capability of —50° to +400°.

In the 700° range the Air Force is concentrating on the development of advanced lubricants and is testing at a fluid with a life of 10-15 hours at that temperature.

An ARDC spokesman said that preliminary studies of various fuels have shown that these fuels possess good short-term thermal stability at 700° and show good potential of improvement by addition.

He added that "in the 800° range, the prospect of obtaining a stable or gaseous material for noncombustible development is possible." However, data from heat tube quantities of materials synthesized in basic chemical studies, indicate that non-organic materials should not be detrimental for SOF operation in the near future.

Now SOF is in a stage where the life of the engine is being studied and other approaches to load power

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—is another example of the constant cooperation between the Armed Services and American industry in the interest of national security. **Excerpt:** write for details regarding challenging policies now open.

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innovation show more promise. We are greatly interested in the use of such materials to solve this problem.

In regard to gases, we had this to say: "In preparation for development and evaluation of 7000 grains, high melting, post-cure and re-cure materials we have conducted a preliminary thickening agent. The work is not outside of this research is indicated by the fact that we have already made acceptable gases using glass fibers as all thickening agents."

"In general support of all our effort at the laboratory and industrial fluids development, a long-range program of research of new materials has been undertaken. These include organosilanes, alkylamines, and other semi-organic, and modified phenolic polymers."

"High thermal stability and a wide liquid range have been the first considerations. All these data have involved 100 tube quantities of fluids meeting these categories. Gallon quantities of certain samples are being prepared for full bench test evaluations."

Engineers are the most creative and sensitive of all engineering materials. They lose their strength, elasticity and even resistance and other reliable properties of high temperatures and it is chemical and nuclear environments. Although chlorine work in the metal weight of a modern aircraft, they risk close to the top when measured by the catastrophic results of their functional failure.

The way some of distances is a prime include fuel oil and oxygen systems, base, powerplants, tanks, ducts, electrical conduits, nose cone, air in down coatings, tires, fuel tanks and O-rings. In a single, modern fighter there are over 100 O-rings.

Moreover, the pilot is largely around in rubber.

The use of distances in tomorrow's very hot and nuclear-powered aircraft means in doubt, according to ARDC research.

As they point out, commercially available polymers exhibit large variations which cannot be overcome by compounding. New and reliable materials and polymers must be developed and unique methods of polymerization must be investigated and exploited. However, even if the most optimistic achievements in this technical area are achieved, more future weapon systems may have to be designed and developed around the elastomeric materials and developing components completely devoid of the materials in need the heat and radiation environments which will exist in tomorrow's weapon systems. This last, domestic approach will only be accomplished at the expense of weight, cost of fabrication and maintenance, and reliability.

Short Sunderland Retired from Duty

London—The Short Sunderland flying boat has been retired from the Coastal Command of the Royal Air Force, making the job of operational service for a flying boat which was first delivered to the RAF in 1938.

A total of 745 Sunderlands were built, the last in October, 1945. It was the first flying boat to be equipped with power-operated turret guns, and during World War II a Sunderland engaged eight German fighters and shot down three before the enemy broke off the engagement.

The aircraft also had an outstanding record on anti-submarine patrol throughout the war as well as on air-sea rescue work.

Although retired by the RAF, Sunderlands still are on duty with the Royal New Zealand Air Force and the French Naval Air Service.

Kaman Forms New Nuclear Division

Bloomfield, Conn.—Kaman Aircraft Corp. is forming a Nuclear Division to be located in Albuquerque, N. M., for extensive analysis and research in the fields of nuclear endurance and propulsion.

Heading up the company's new division as vice president and general manager will be Dr. Kenneth W. Fockens, recently chief of experimental research for the Soviet Corp.

Northrop Workers Receive Pay Boost

Hamden, Conn.—Approximately 11,500 Northrop workers at Northrop Aircraft, Inc., received a six-cent an hour pay increase as of Jan. 25 under the company's newly established cost-of-living program.

This was the first adjustment under an executive plan given to the firm as full as the Consumer Price Index. It will add more than \$100,000 monthly to the Evanston, Ill., manufacturer's payroll.

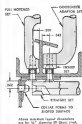
USAF Awards \$16 Million Contract to Aeroproducts

Darien, Ohio—USAF contract of \$16 million was awarded Aeroproducts Co. as a follow-on order for additional propellers for the Lockheed C-130 Hercules.

Aeroproducts' three new military propellers are certified by the FAA after qualification test in August, 1957.

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NACA Says Loss of Scientists Threatens

By Evert Clark

Washington — National Aeronautics Committee for Aeronautics is making its strongest appeal yet for Congress to help stop the loss of top scientists and engineers—a loss that threatens the "leadership in aeronautical science and America's supremacy in the air," according to Chairman James C. Hanes.

Scientists and engineering scientists and engineers have become more and more difficult for all the government agencies as industry competition for their skills has increased. This has been particularly true since 1950.

Value of NACA's Work

NACA is a prime target for simple reasons—the quality and the importance of its work. A great part of NACA's research is one of the very frontiers of aeronautics.

Rapid expansion and progress in aircraft and aircraft design and production have placed the skills of these "frontiermen" in great demand.

Unfortunately for aeronautics as a whole, many leading scientists who transfer from NACA to industry shift from fundamental research to design and manufacturing. Resulting there is no one left, either in the industry or the long-range future, to become industry's, with its higher salaries and fringe benefits, attracts not only top end middle level researchers and engineers, but an increasing percentage of new graduates.

Equal Pay Urged

Although many steps have been taken to help remedy the situation, more can be done. In a letter to the House, accompanying NACA's latest annual report to Congress, Dr. Hanes said "the simplest and the best" way to meet the problem is legislative adjustment of the government's "pay the going rate for engineers and scientists."

Since the end of World War II, there have been a number of government studies on the question of attracting and keeping scientific manpower. More than 100 reports.

Almost without exception, they find that the largest single problem is pay. Various recommendations will keep a scientist or an engineer in government work at a lower salary than he would receive in industry—but generally this comes to be true in one way or the other because the salaries and other fringe benefits become too large and, therefore, too tempting.

After the 1949 NACA annual report, the loss of scientists and engineers has been more and more

ing scientists and engineers, and its pay scales were more nearly in line with industry's. Kansas was expansion and continued high employment at the aircraft industry—the fact that industry's starting salaries are among the highest for all industries changed the picture.

Government-Industry Salaries

In 1951, when industry was paying beginning scientists and engineers a little more than \$508 a month to start the government was paying about \$345. In 1952, the difference was about \$350 to \$380. For the next two years, industry's pay went up, while the government's went down.

In 1954, when industry was paying a little more than \$508 a month to start the government was paying about \$345. In 1955, the difference was about \$350 to \$380. For the next two years, industry's pay went up, while the government's went down.

Disparity is somewhat greater for top-level scientists, even when bonuses and stock plans are not considered (see chart).

Of even more concern to NACA is the effect of industry's higher pay and unbalanced scientific techniques have had on the quality of personnel.

In 1951, 75% of NACA's engineering scientists came from the top quarter of their class. By 1955, the figure had dropped to 60%. In 1955, it had fallen to about 50%. In 1956, it stood just below 40%, and for 1958 it had reached approximately 34%.

Rate of turnover in NACA scientists and engineers in a salary range from about \$4,900 to \$11,000 rose from about 5% in 1951 to approximately 35% in 1956.

NACA has few employees in the middle salary ranges, and even fewer at the top. Most of its top men are scientists who gained the bulk of their experience in NACA's own laboratories.

Notwithstanding this loss at the top is a decrease in wage at the bottom of the scale. The federal government employs approximately 35% of the nation's engineers. Based on that figure, it should have about 10% of the production engineers in any year. In 1955, it got only 6%.

NACA's figure is about the same as the governmentwide figure. It is a considerable clue to it is a letter to Congress accompanying his annual report that "we do not quarrel with the salaries paid by industry."

But he and the "attractiveness of public service has been seriously decreased" by industry and "fringe benefits" offered by industry.

"We meet not only people additional fringe benefits but also offer rates of compensation sufficient to attract and to hold the scientists and to attract research to perform the best research that government program," he said.

NACA's senior scientists "have made large contributions to the advancement of aeronautics" only the view at a very small cost "compared with the value of the results" Dr. Hanes said.

"We are confident that NACA can continue to show the way to superior science... if the Congress will provide the required support."

NACA is now, because of budget limitations and a heavy backlog, the difficulty in obtaining the quality of personnel it would like, it employs only 7,700. In the fiscal 1958 budget, it has asked authority for 8,000—but the employment level of NACA scientists and engineers has lagged further and further behind its authorization since 1951.

About 1,708 of NACA's total are in research personnel. Some 100 are supervising engineers and physical scientists, responsible for designing, building and maintaining NACA's complex of laboratories, wind tunnels and other equipment.

Another 1,300 are wage earners in the trades and crafts—and there are the only employees paid on a dollar-for-dollar basis with industry. The remainder of the 7,700 are administrative and supporting personnel.

What Loss Means

The effects of the loss of scientific talent on NACA's efforts on air and space are so important researchers leave NACA has made a careful and extensive survey of the question. Some of its findings:

• **Loss of senior talent.** A key to research, entry transition, and the issue leading on technological matters left NACA severely for approximately 50% more than he was being paid. He can expect 100% more than his NACA salary after a reasonable period.

• **Continuation of essential research.** A relatively new, highly complicated and important field of research at another laboratory was cut back considerably because the most important man in the work went to industry.

• **Inability to explore new developments adequately.** Important research related to Richard T. Whitcomb's "area rule" was curtailed shortly after one project scientist was transferred to industry and the next two men assigned

U.S. Lead

to the project moved to industry for higher pay.

• **Loss of effective research direction.** An international science population is put toward to industry for a substantial salary increase after 35 years with NACA. This loss NACA may cause a significant void in the benefits of approach and furthering scientific thought needed for research in its field. The committee also lost "the major talent in terms of training and development in the field" and the loss results in the "abandoning of an integrated labor force approach."

• **Defunding of effective research teams.** Loss of a critical part of a team of research teams will have the effect at least for a time of "destroying an efficient research team and reducing the output of the entire group."

NACA last year had 78 "supergrade" jobs, in which it could use its top scientists about \$11,000 a year. It asked the Congress for 50 new positions under Public Law 511 which exempted employees from certain other restrictions imposed by the Classification Act, although they remain within the Civil Service. NACA already had 10 P.E. 111 positions.

Percentage of the bill would have made a total of 80 P.E. 111 positions, in which NACA could have paid from \$11,500 to \$19,000. Congress approved only 25 new positions, giving NACA a total of 33. Some provision in the "supergrade" positions were shifted to P.E. 101 jobs, and NACA's total was set at 25 "supergrade" positions in addition to its P.E. 111 jobs.

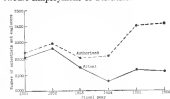
What NACA Wants

To make the "further advance in the art and technology" that Dr. Hanes says are "essential to our national security" and are needed "at a possible accelerated rate," NACA and possibly other government agencies faced with the technological manpower shortage will ask Congress the use for:

• **Revisions of federal pay system for scientists and engineers** to provide flexibility to adjust salaries to meet competition and to recognize individual differences in ability and demonstrated performance; adequate pay for top executives to enable them to continue government service without financial sacrifice; and to encourage young scientists to pursue government careers.

• **Retention of scientists** on public service contracting techniques to enable federal agencies to use paid consulting pay applicants far travel to institutions, pay travel to the first job, including housing of household goods, and to permit use of employment agencies.

NACA Employment of Scientists



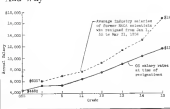
Personnel Losses

	Fiscal 1955			Fiscal 1956		
	Employed	Number Lost	% of Loss	Employed	Number Lost	% of Loss
Top Research	92	6	6.5	88	12	14.0
Leaders	1,000	114	11.4	1,712	249	14.5
All Research Personnel	1,092	120	11.0	1,712	249	14.5

Where They Go

Industry	15 Mo. Period, 1955-56		18 Mo. Period, 1956-57	
	Per 100	Per 100	Per 100	Per 100
Industry	71	42	71	42
Military Service	30	14	30	14
Other Govt. Agencies	9	24	9	24
Research in School	45	10	45	10
Nonresearch in Industry	45	80	45	80

And Why





L. K. Edwards (center), head of the Advanced Design and Systems Analysis Department, discusses atmosphere effects on missile

guidance with E. Lawell (right), Advanced Design Staff Engineer, and W. F. Wright, head of the Analysis, Plans and Reports Section

MISSILE SYSTEMS ANALYSIS—a field of varied assignments

Engineers and scientists seeking a wide range of assignments will be interested in Lockheed Missile Systems Division's concept of systems analysis. For at Lockheed, systems analysis responsibilities involve virtually every phase of missile preliminary design and development. Essentially, engineers and scientists in this department formalize overall analytical treatment; perform original analyses when problems defy conventional handling; coordinate analytical activities among different departments.

Present openings are in areas related to internal guidance, functional systems, power plants, control systems and overall weapon configuration. Openings are at Sunnyvale and Van Nuys Engineering Centers.

Inquiries are invited from engineers and scientists whose ability and aptitude demand a wide range of assignments.

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research and engineering staff

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February 26-28

Safe Flight Speed Control Indicator Evaluated by Royal Canadian Navy

The Royal Canadian Navy is evaluating Safe Flight Instrument Corporation's Speed Control Indicator for installation on all 46 of their McDonnell 1211 2-seater carrier fighters. The slow speed and relatively small size of the IMICS Installation, used to be the only RCN aircraft carrier, demand accurate, precise control of leading approach speed.

Minimum approach speed for the F2H is about 105 knots. Landing speeds greater than 90 knots relative to the deck require unacceptable loads on the winging gear. The Royal Canadian fleet includes modern aircraft at 18 knots.

Maximum Speed

The means that the maximum approach speed which the Canadian fleet does not set in on land conditions is 185 knots. The 1.0% sensitivity closed for the Speed Control Indicator is needed if the winging error pilot is to stay within the three knot coverage between maximum and minimum approach speeds. The indicator is mounted above the left side of the instrument panel where it is close to the line of sight from the pilot to the runway landing aid or landing signal officer.

One needle with deflection represents a 2.2 knot variation from the calibrated value. Range of the indi-

cator is 18 knots from pig to pig.

The SCII is an extension of the principle used in the manufacturer's prototype still indicator.

It works by measuring movement of the stagnation point on the wing lower leading edge as angle of attack changes.

In the lower part of the air speed scale when angle of attack turns rearward with speed change, the movement of the stagnation point is a direct control measure of lift from the air speed indication.

This is true because air speed is only one of the variables which affect lift while the position of the stagnation point is sensitive to all variables except in some cases to a change in the configuration of the wing created by extending the flaps.

Lift is given weight and density aside and among the factors which affect the position of the stagnation point is the air speed. The pilot is faced if the accuracy of computing the right air speed for various in these factors.

Feeds Signal

A flip position potentiometer feeds a signal to modify the output from the variable reluctance transducer of the leading edge vane. This is necessary because the lift associated from the flaps and the position of the flap-

Scientists and engineers attending the conference will be interested in significant activities at Lockheed Missile Systems Division in

Planning and direction of specialized computers
Data correlation techniques

Positions are open in Van Nuys, Palo Alto and Sunnyvale, California, research and engineering centers.

M. H. Seard and active members of the technical staff will be available for consultation at the convention hotel. Interviews may be arranged by phoning HOLLYWOOD 9-3521.

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MISSILE SYSTEMS DIVISION



Jeep By Air

Army's newest and biggest helicopter, Sikorsky H-19A, delivers a Jeep to Caribbean Airway Command at Fort Meade, Va. Two-engine aircraft has chined leading front and rear, an accommodates 16 fully-equipped men, operating up to 10,000 feet, weight 10,800 lb. Chaper is being marketed by Army's Aviation Test Board, Fort Rucker, Ala.

USAF Reports Rearward Seating Safer

By Robert L. Stanfield

An Air Force study, covering all USAF transport aircraft involved in accidents over a two-and-a-half-year period, shows that aircraft in the rear, facing the rear, were seven times greater than in the front of those facing the rear.

Preliminary data concerning accidents in relation to seating in transport aircraft was presented at the annual meeting of the Institute of the Aeronautical Sciences by Col. H. G. March, chief of the USAF's Aero Medical Section, Dayton, Ohio, at the Wright-Patterson Air Force Base. Complete report will be presented at the annual meeting of the Aero Medical Association in Denver, May 6-8.

The study revealed aircraft crash accidents so as to include comparisons among all types of aircraft carrying passengers. It indicated that head injuries were the most frequent cause of death in survivable accidents—except that in these cases there were no fatal head injuries to occupants of aircraft facing rear. Preliminary report appears to indicate that passengers in rear seats generally appear to be healthier.

High impact transport accidents involving 517 people over the 18-month period, resulted in 699 major and fatal injuries. Though this type accident breeds highest number of fatalities, greatest percentage of those surviving, but with major injuries, was 12.5% of survivors—usually once survivors.

Survivable Accidents

Of 1,185 occupants involved in all survivable transport accidents 2,990 suffered no injuries, including about 100% of those facing the rear. In comparison, 4% of those facing forward and 20% of those facing rear were fatalities.

Figures for all accidents (high impact and survivable) indicated that 95.1% of passengers facing rearward suffered no injuries. Of those facing forward, 13.1% were fatalities and 4.1% received major injuries. Preliminary study found the total had mortality rate of 1%, of those, 4.4% received major injuries.

Most individuals involved in USAF transport accidents were passengers, not crew.

Lip belts were indicated as use. In some accidents crew members also were shoulder harnesses. Protective helmets were seldom, if ever, in use. Fatalities included all type injuries, including burns.

USAF now has rearward facing seats in all aircraft used strictly for passengers. Majority of accidents occurred as aircraft accidents are credit due to once past being shown in upon impact or dis-

Injuries in Relation to Seating/Transport Aircraft All USAF Transport Accidents—2½ Year Period

	Not Injured		Minor		Injured		Fatal	
	No.	%	No.	%	No.	%	No.	%
Seating	193	99.0	11	5.6	14	9.9	99	50.0
Forward Facing Seats	194	99.0	49	25.3	102	51.7	119	59.4
Rearward Facing Seats	199	99.0	0	0	2	1.0	0	0.0
Forward Facing Seats	276	94.0	27	9.4	0	0.0	80	24.0
Rearward Facing Seats	216	94.0	0	0	1	0.5	39	18.0
Total 12,000	2009	99.0	110	5.5	503	25.0	417	20.5

*Position unknown due to incomplete reports or lack of survivors. Columns indicate that probable distribution in this category was 30% forward, 35% forward and rear, and 35% (standing or unseated).

to inadequate restraint of head or its location with their suitcases falling during abrupt deceleration.

Passenger Tie-Down

While AF feels that rearward facing seats are best and safest, Colonel Hinkel emphasized necessity of passengers tie-downs must be held.

A British study of the relative rates of air and ground facing seats also is reported through in favor of those facing backward. However, Aviation Crash by Dr. Kenneth of Cornell University is now forward facing aircraft (Aviation Nov. 5, p. 69).

Dr. G. Hinkel believes that when seat of aircrafts fail and the occupant hit, possibly due to the length of the seat, the head of the air facing passengers is forward and is used against dunes and structure. That failure of the seat is down is considered more likely with air facing seats in aircraft seats. Dr. G. Hinkel also feels that the value of dual air straps for passengers in aircrafts has been overstated.

Four Flight Planning

Tending to accidents involving all types aircraft Colonel Hinkel and that poor flight planning and poor flight discipline as the most frequent causes of flight crashes. Hinkel is particularly concerned with high-altitude, power-on, stalls. In view of the fact that high-altitude stalls, landing, takeoff or go-around are usually due to insufficient and experience, especially the latter in, and.

He stated that the largest/primary factor in aircraft accidents and that a no particular priority as to the type of accident which might result.

Capt. Carl P. Wilbur, head of the Navy's Aero-Medical Section, at Naval Air Station, stated that 64% of the Navy's aircraft accidents in 1955 were attributed to pilot error, 50% of all accidents occur in the training phase.

He and the crew might be one "two" and failed to communicate from it, in fact, built into the environment of our topography.

A Harvard Hinkel, doctor, Dr. G. Hinkel, stated that since it was not yet possible during in 1955 will be expected to save as many as 127 people to injury and accident.

He pointed out that accidents involving civil jet transport will cause more people per accident, per accident, than are expected in the DC-3, C-119 and DC-4 type aircraft whose maximum capacities range from 28 to 50 people.

Accident data, said Hinkel, must be presented in that it is a public item. In the opinion concerned with design of aircraft, Dr. G. Hinkel can speak out for this work, covering three jet may save.

- Six degrees of accident conditions, (angle and velocity of impact etc.)
- Six degrees of accident conditions, by the probability scale of the accident.
- Ten degrees of injury, of which two concern the "sustained of fatality."

Code area at ensuring effective design improvement.

Deficiencies of design in aircraft, however, he stated, often cause injuries in survivable type accidents. Examples of the aircraft are accidents wherein seats, non-securely fasten the safety in accident practiced their skills of facing occupants, hand, structure, pushed down on passengers etc.

Rainfall Pathologist

Role of the pathologist in aircraft accident investigations was stressed by Col. M. T. Townsend, USAF (MC), Deputy Director, Armed Forces Institute of Pathology. He cited some common problems that still must be overcome.

- Lack of interest in post mortem examination of body, involved from an early accident.
- Lack of specific guidelines for the post mortem of such operations.



Bell XV-3 Modified for Testing

Bell XV-3 is modified for test program with extending lift struts and further lengthening of main fuselage for dynamic test, and with a temporary installation. Change in seat length also is for dynamic flight test program. Other changes are likely, including installation of two-rod seats. This is the first month.

active point are not always directly related.

The flap position potentiometer must be calibrated in flight in all configurations to insure that its output is as performed to the test aircraft.

The SCI with a stick/sensor still warning that been indicated for all of

the RCN's de Havilland GSF (Compass 517) conventional air-sea rescue aircraft. It is also in service in some private and USAF airplanes.

In particular de Havilland, as a conventional aircraft, there is a change in the position of the lift potentiometer from the propeller shaft to the wing.

The outputs from the leading edge vane transducer, the throat airspeed sensor and the flap position potentiometer are incorporated by a lift computer. The unit attended for multi-engine aircraft weight in pounds and is available for use with 27.5 VDC and 12 VDC systems.

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Trend Toward Less Time Indicates Decreasing Possibility of Escape

Successful bail-outs and successful ejections from high-performance aircraft are reducing with progress. The percentage of successful bail-outs was less than 10% in 1935. During the same year an ejection seat escape of less than 60% was realized. By comparison, during the period 1911 to 1946, successful bail-outs were obtained in 11 out of every 12 attempts.

Trend in escape versus time, compiled

by high-speed, high-altitude aircraft, indicates an ever-decreasing possibility of attaining a successful escape. Limiting conditions on present escape were presented by Thomas G. Kilguff, TSD Project Test Pilot, Douglas Aircraft Co., at the annual meeting of the Institute of Aeronautical Sciences.

During the past six years, speeds have jumped from 100 to 300 knots per year. Quoting Dr. Fritz Haber,

Kilguff also stated that future increases in speed will necessitate a linear increase in altitude reaching to Mach 5 at approximately 200,000 ft.

Critical Airspeeds

As things stand now, bailouts at equivalent altitudes in excess of 200 km result in an absolute decrease in successful escapes. And while the ejection system has been referred to as effective at 600 knots and above, experience shows that at speeds in excess of 450 km there is less than 50% chance for a successful escape. The successful escape also becomes more critical in altitude above 15,000 ft. and Mr. Kilguff.

This condition, he told Aeronautics Week, is capable of engineering solution—a matter of applying talent to correct the problem. At present Douglas Aircraft is working on a long-range program towards a solution. Short-range programs are currently in being at Lockheed, an downward ejection, and General, an upward ejection.

Engineering effort is aimed at solution of following problems:

- Changing the airplane structure—air speeds in excess of 450 km are critical for upward ejection.
- Reducing deceleration, tumbling, windshield effects, and parachute opening shock to within limits of human tolerance.

Although opinion was expressed for increases of 10G acceleration, Kilguff noted that discomfort at the time has occurred as low as 9G due to airplane roll position at vertical ejection. Solutions must also be provided to problems of parachute stress, heat-burn and acceleration.

Operational statistics, and Kilguff, show that 70% of actual emergency conditions necessitate an immediate escape rather than a controlled one.

Pilot-Operator Data

The importance of pilot-operator data, and factors involved in obtaining, evaluating, and interpreting reliable pilot opinion, was discussed by George E. Cooper, Chief Aeronautical Research Pilot, Ames Aeronautical Laboratory, National Advisory Committee for Aeronautics.

Need for a more universal calibration of pilot opinion, through a standardized adjective rating system, was stressed by Cooper.

Aircraft characteristics that still must be judged by "pilot opinion" include pitch-up, stall, loss of handling in a turning turn, buffet, auditory, cargo attitude of stall warning, etc. Subjective impressions on test pilot the responsibility for airplanes in which design decisions can be based.

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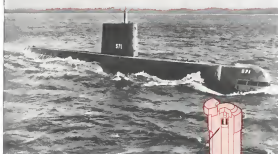
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Working closely with the Atomic Energy Commission, the Westinghouse Electric Corporation designed and built the power plant for the NAUTILUS, first atomic-powered submarine. The seaworthiness of every engineering principle, every individual part—including the GRAPHITAR pump bearings—has now been proved to the point that 10,000 miles the submarine has steamed, approximately half was submerged. These Westinghouse-designed pumps are hermetically sealed outside the integrated pump and drive motor. All leakage past the pump seal is contained within the flooded motor while the purely electrical elements are enclosed in "cast" to exclude the water.

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validity of such pilot opinion data, Cooper suggests:

- **Recording** of question: Questionnaires must be specific enough that a response or interpretation is necessary after pilot's opinion is given.
- **Assignment** of adjective rating system. If pilots want to report their opinion on a continuous scale, validity of data would be obtained in adequacy or in adequacy of our present specifications.
- **Initial and final impressions.** Operator expressed by a test pilot during first few flights of airplane or installation may reflect more accurately what will be the reaction of the operational pilot than his opinion after complete familiarity is obtained. NACA records and evaluates separately the initial and resultant opinion at completion of program.

Ground Simulators

Ground simulation can potentially furnish a means for evaluating a particular airplane, its control system characteristics, and in advance of actual flight. At Ames, for example, ground studies were conducted in relation to aircraft pickup characteristics and determining minimum comfortable landing approach speeds of specific aircraft.

Simulators, emphasized Cooper, cannot include all factors that influence pilot reaction or opinion and close one kind to an overall evaluation.

Air Associates Changes Name

Teterboro, N. J.—**Air Associates, Inc.** has changed its name to Electronic Communications Inc., recognizing a shift in emphasis in the company's operations. The Aviation Supply Division with eight bases throughout the country will continue to go by the old name as a subsidiary of ECI.

Airlines and electronics work, accounted for about 40% of the company's business in 1946 and is expected to reach about 75% by 1950. ECI President Frank W. Godes Jr., who joined the company in July, said, "The aviation supply business is still expanding and will probably continue to be our largest and best for awhile."

Headquarters and production operations will move from Teterboro, N. J. to Piedmont County International Airport, St. Petersburg, Fla. The move will be made gradually, project for project and is expected to be complete by the end of the year. The engineering staff will be moved to St. Petersburg from Orange, N. J. by the end of 1948.

Godes said that the biggest part of the engineering staff will probably come with the company but most of the man selecting people will be local people.

Fairchild Engine Division and Gas Turbine Laboratory present IMPORTANT ENGINEERING POSITIONS

Fairchild Engine Division is now expanding its engineering staffs in its plant and Gas Turbine Laboratory at Dear Park, Long Island, New York.

Investigate these positions:

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For mechanical design of turbine engines and components, and to conduct preliminary design study investigation on gas turbine engines.

MECHANICAL DESIGN ANALYTICAL ENGINEERS

To work closely with design engineers and to make recommendations as to needs of analytical studies, with respect to stress analysis of lightweight rotating machinery, vibration, analysis, cyclic analysis, creep, analysis of mechanical component failures and general mechanical problems.

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Master's degree for aircraft systems. Familiar with engine-airframe mission analysis for modern aircraft.

TEST AND DEVELOPMENT ENGINEERS

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AVIONICS

Airborne Computer Would Lessen Routine

By Philip J. Klein

New York—A proposal to replace the multitude of analog computers now used aboard aircraft with a single central digital computer which could relieve the flight crew of many routine (how good?) computations now performed manually was made at the recent meeting of the Institute of the Aeronautical Sciences.

The suggestion that the airlines adopt a central solution philosophy of integrating all computational functions in a single digital computer came from Vernon I. Wolfe of the Air Transport Association and Niche.

Wolfe proposed that the airlines form an operational group to define their needs, then work out the best ability and economies with avionics equipment and airborne digital computer manufacturers.

Digital Computer Advantages

The principal advantages of the digital computer over the analog type are its great versatility and tremendous computational speed which enable it to solve a variety of different problems, almost simultaneously, as far as flight loads are concerned.

Wolfe cited the following examples of tasks now performed manually by the flight crew, which could be easily handled by an airborne digital computer working from automatic input data provided by altitude, speed, heading, fuel flow, temperature and other sensors.

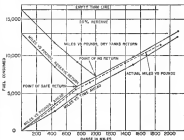
- Dead reckoning and efficiency navigation.
- Cruise control, determining most efficient throttle setting. When gross efficiency goes down, efficient cruise control will become even more important.
- Flow-gross information on point of safe return with fuel reserves and point of no return, both for manual and emergency (engine out) conditions.
- Central navigation integration.

Anti-Collision Use

One of the most important applications for an airborne digital computer is in anti-collision systems, Wolfe said. If such systems are to be effective, they must be able to compute the possibility of collisions between own-ship and two or more target aircraft simultaneously. "This is a natural for a digital computer which can compute the collision threat for a number of targets at the same time



AIRLINE use of airborne digital computers like North American unit shown above, has been proposed to replace functions of existing individual analog computers and to relieve flight crew of routine manual computations, like "how good?" chart below.





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Curtis on Progress

Edward F. Curtis, the President's top old assistant for Airforce Facilities Planning, will share the progress of his group's year-long study of the nation's requirements for the next 20 years at a luncheon meeting on March 18 in New York.

The meeting is jointly sponsored by the Institute of Radio Engineers' Professional Groups on Aeronautics & Non-personal Electronics (IRAGNE) and Military Electronics (IRAME), and will be held during the national IRE convention. Tickets, priced at \$400, are available from William McNulty, 475 Fifth Ave., New York City.

an analog computer to solve the problem for one, Wicks indicated.

A digital computer could perform the ILS instrument approach function, now required for flight direction and autopilot, and probably do it with more refinement and economy than the present analog computer, Wicks believes. If the aircraft adopt Doppler radar auto-navigation, the digital computer could perform the function too.

Emergency Features

The digital computer is so versatile, Wicks believes, that it could control even monitor the flight crew. For instance, if the pilot should attempt to lose the landing gear when approach speed is too high, the computer could sound an alarm.

During final approach the digital computer might be programmed to run through a check list, double-checking the flight crew. If temperature rises below a certain value, the computer might call for closing of the cool fans or radiator heat. Monitoring the flight crew is particularly advantageous under emergency conditions, Wicks pointed out.

Pilot Reaction

IAS panel moderator David Little of American Airlines, himself a pilot, made the following comment on possible pilot reactions to Wicks' proposal.

"Even in today's aircraft, more than anything else the pilot needs time to think. Anything that reduces the flight view of instrument cockpit data will be welcomed."

The progress made in the past several years in miniaturizing and increasing digital computer has without any doubt made it possible to install a control digital computer, and a duplicate for standby, at an expense in size, weight and cost over existing analog computers, Wicks said.

There are a number of companies working on the airborne digital computer field. Douglas Aircraft Co. is

building a control digital computer for later versions of the F-102. Litter Industries is developing a smaller computer for the Navy and Douglas Aircraft which also will include radar cockpit instrumentation and display functions. Librascope, North American, Philco and Radio-Whoddy also are active in the field.

Wicks believes that future requirements are far less demanding than military requirements for control, and this should permit the use of less costly equipment.

Expansions, Changes In Avionics Industry

Thurston Associates, Inc., Long Beach, N.J., will open an analog computer center in Brussels, Belgium, early this summer, making the new facilities available to Western European industry. Company now has computer center at Princeton, N.J. and in Los Angeles.

Other recently announced expansions and changes in the avionics industry include:

- **Radiation, Inc.**, Melbourne and Orlando, Fla., has formed an subsidiary, **Dikewood Corp.**, in Albuquerque, N.M., to serve primarily as consulting agency for the missile and rocket divisions. Dr. William H. Dike and Dr. Walter D. Wood, both formerly with Spaulding Corp., will be president and vice president of new firm.

- **Sutton Corp.**, Concord, Calif., is name of newly formed company which will design and manufacture control and data processing systems. Company is headed by G. H. Brown, Jr., former general manager of the Berkeley division of Bushman Instruments Inc.

- **Electroch, Inc.**, Chicago, affiliate of Borg-Warner Corp., has been officially added into RJ Electronics, B.W.'s electronic division at Santa Ana, Calif. Electroch makes engine instrumentation.

- **Walden Industries** at Division of F. C. Brock & Sons has opened new 52 and has facilities at The Hills, Hightstown, N.J. N.Y. Facility will be used for development and manufacturing of precision hydraulic and electronic equipment.

- **C. P. Clare & Co.**, Chicago, relay manufacturer has opened new field in engineering and sales office in Los Angeles at 6847 Hollywood Blvd., headed by J. R. Shaw.

- **Aerborne Accessories Corp.**, Illinois, N.J., maker of actuators and electronic relays, has opened latest office in Los Angeles at 8003 Lincoln Blvd.



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Then, on the civilian issue, there are projects like completely re-manufactured telephone switchboards, and electronic systems for avoiding data about every flight car to transit over a railroad.

These also require nothing less than perfection.

The net result of America's insatiable appetite for electronic research and production has been a phenomenal growth in our business and the contribution of the new Stromberg-Carlson "Electronic Center"—the 600,000 square foot plant pictured above. Every inch and every person in it are dedicated to continuous advances in national security and the home-front economy. We're proud to be at your command.

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• **Kelvin Electric Co.**, Van Nuys, Calif., is a name of newly formed company which will make precision wire-wound reactors and magnetic networks. Company is headed by W. F. Elliott and K. T. Elliott, formerly president and vice president, respectively, of Elvac Co., Inc. Kelvac's address: 1997 Noble Ave.

• **Rhodes Manufacturing Co.** has opened enlarged electronics research laboratory and manufacturing facility, more than three previous sites, at 1777 Industry Ave., Ames, Calif.

• **North American Aviation's** Aerospace Division, Downey, Calif., and Qualitest Inc., Burbank, Calif., have been elected to membership in the Radio Technical Committee for Aerospace.

NEW AVIONIC PRODUCTS

Instrumentation

• **Rectilinear oscilloscopes**, two-channel and polywaveform type recording oscilloscopes with 0.25 sec. full scale rise time. Full scale deflection is 4 in. Motor waveforms with sensitivities of 1, 5, 10 or 25 mv. signal for full scale deflection are



available, with d.c. sensitivity of 1% full scale. Scan per inch permits reduction of size, one of 10 chart speeds. These instruments, Inc., Industrial Instrumentation Div., Houston, Texas

• **Transducerized automatic transducer** permits use of variable reluctance pickup instead of potentiometers without



welding, test set-up. Transducer operates from a.c. or d.c. power, and when connected to variable a.c. variable reluctance transducer produces a d.c. or a.c. signal proportional to transducer movement. **Lincoln Engineering & Research Co.**, 1440 North Park Road, Los Angeles, Calif.

Components & Devices

• **Choke-type wire-wound reactor**, Type 100A, encapsulated, for unattended mount use, contains 100% m. contact in resistance up to 500,000 ohms.



rated 0.6 watt, in tolerances of 1/2 to 1% **The Davis Co.**, 530 West Mt. Pleasant Ave., Lexington, N. J.

• **Measure thermal noise**, operates on base current principle and can withstand 200G shock, vibration between



20 and 3,000 cps, over temperature range of -100F to 450F. **Nitronix Electronic Corp.**, 14250 Dwyer St., Van Nuys, Calif.

• **Miniature floated integrating gyro**, called MFG for short, has angular rate members of the larger HIG-3 (10 gals./sec.), yet measures only 11 in. dia., 7 1/2 in. long and weighs less than 4 lb.



Total drift rate is less than 0.5 deg./hour according to manufacturer. **Vincor Electronics Co.**, 4400 Woodland Dr. and, 2500 Redway Road, Menlo Park

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6. stainless steel plate
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THREE AUTONETICS ENGINEERS ON THEIR WAY UP



In just 4 years, Earl H. Smith has risen from Senior Research Analyst to Group Leader in charge of the Autonetics Engineering & Research Department. Among his other past personal achievements, "Earl" has served as president of the company, including an overall executive chairman and a board member in charge of the company.



Donald Greenleaf (DGE) is the head of Group Leader in charge of development and design of electro-mechanical components for aircraft instrument control systems at Autonetics. From Southern California's early life, he has been a member of the Autonetics company since 1954, when he joined the company as a research engineer.



Dave Eberle (General Manager) is in charge of the company's operations. He is a former Group Leader in the Autonetics company and has been a member of the company since 1954, when he joined the company as a research engineer.

Autonetics
A Division of North American Aviation, Inc.



BUSINESS FLYING

ADVANCED rocket engine subassemblies built by North American B-13 executive instrument (right) provide a total of 1,000 lb. additional thrust in emergency—rough 140 lb. each barrel. On this installation for Volkswagen Aviation Service Division, the standard Autonet rocket powerplants are mounted at 141 deg. to the B-13's thrust line, keeping thrust applications within e.g. limits of some aerodynamic effect.



MASTER HERCULES in phase (left) takes on a load of fuel from a tanker (right) mounted on a truck during top-down operation in New Zealand. The Hercules can carry 100,000 lbs. of fuel, and is designed for operation in operation and maintenance. It is intended to have direct operating costs of \$25-\$30/lb. Powered by a 240-hp. engine, the plane gets off the ground in 500 ft. at 1,675 lb. gross weight, has an overall rate of climb of 500 ft./min. (1,600 ft.) spray tank system holds 175 gal. of chemical.

HOMERULET SINGLE-PLACE (right) plane, light aircraft and assembled in Southern U.S. Autonet chief pilot Carl Eberle, New York, is stated to have an 11-hr. endurance with auxiliary 15-gal. tankage. On all metal construction, the plane is powered by a 90-hp. Continental and has a cruise speed of 141 mph. Empty weight is just over 600 lb. and gross weight is 900 lb. Span is 22 ft., length 20 ft., height is seven feet. Wings under NACA 23012-25009 airfoil section. Retractable biplane landing gear is hydraulically retracted and is spring loaded to provide positive down lock in event of system failure.



LIGHTWEIGHT TRAINER (left) undergoing tests in Germany is a 1413 Buehler Schoolmaster (Schulmeister), a twin-engine, pusher powered by either 65 or 80 hp. Continental or 55 or 75 hp. Pumper. Cruise speed is 90 mph, top speed 106. Engine weight is 770 lb., gross weight is 1,370 lb. Normal weight is 142 lb., adding overhead loads increases this to 327 lbs.

AUTOMATIC CONTROLS MAN HAS NEVER BUILT BEFORE



The Boeing B-47—its six jet engines each supplying 4,000 pounds thrust, put it in the "600-mph per hour speed class." Operating range is more than 2,000 miles.

Cold drawn Shelby Seamless Tubes provide *high strength, low weight* outrigger struts for B-47 Stratojet



The landing gear of the 169-ton B-47 Stratojet consists of dual main wheels in tandem with single outriggers attached to the inboard main pods. The outer cylinder of each of the outrigger struts is fabricated from cold drawn USSB Shelby Mechanical Tubing.

Shelby Seamless is extremely strong and shock absorbent in proportion to its weight. Thus, it is ideal for dampening air loads from gusts, engine mounts, fuselage wing tips, landing struts, and tail assemblies. Moreover, with Shelby Seamless Tubing, the basic shape for curved struts is already made—and each section of tubing is as sound as the solid steel forgings from which it is produced. Homogeneity uniform and dimensionally accurate, Shelby Seamless Tubing is easy to bend, shape, machine and weld.

Shelby Seamless is produced to existing aircraft standards, in a wide range of diameters, wall thicknesses and steel analyses. For further information, or for help in applying Shelby Seamless Mechanical Tubing to your design specifications, write to National Tube Division, United States Steel, 635 William Penn Plaza, Pittsburgh 30, Pennsylvania.



"WELD WITHOUT WELD" The weld entry of the mechanical tube of National Seamless Tube and Tubes is available free of charge for drawing in technical groups, clubs and groups. This advertisement would like to be helpful in obtaining technical data of the steel products and all operations are conducted with the following:

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SHELBY SEAMLESS MECHANICAL TUBING



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CAA Issues Directive Covering Lycemings

New operational procedures have been ordered by Civil Aeronautics Administration covering the Locomotive C-180 C high compressor and C-180 A since a prolonged engine porting duration at the cost of engine problems encountered by some users.

Aircraft with these powerplants include the Aero Design 550 A/100, 650, Beech D-50 and E-50. Serials C-180 713-657.

Burned piston resulting in some cases in single-engine emergency landings are avoided. However, Locomotive has been unable to duplicate the condition on the test stand as it being a licensed Aero Commander serials are checked at its Wilkes-Barre, Pa., plant.

The CAA's authorization directive (C7321) outlines three requirements by operation of aircraft with the above engines:

1. Prior to first flight and every 40 h thereafter, check the leakage of the mixture control area to ensure that the lever arm on the valve stem in the fully open position when the cockpit control is set in this position.

2. Prior to first flight the following placard must be placed in a prominent position on the instrument panel or control pedestal. This aircraft must be operated with engine control in the FULL RICH position under all operating conditions. Manual leaning is not permitted. Move the mixture control off full rich only when stopping the engine.

3. Compliance required by Feb. 25, and thereafter, when the engine is changed in any part of the aircraft or engine induction system is altered.

Flight checks at 65% normal rated power at least flight to ensure that fuel consumption of each engine is within



Offers to Work With UN in Suez

One of four de Havilland Canada Otters assigned to work with the United Nations Emergency Force in Egypt for reconnaissance, short-range communications and supply duties during UN ground wars. Numerous reports indicate that the aircraft is well equipped with communications gear. The four UN Otters, among 15 aircraft, were shipped to Port Said shortly after Canadian Navy carrier Magnificent.

The latest specified on the Locomotive power and fuel check for the particular engine model. This check must be conducted with an accurate fuel flow meter or by any other accurate method of determining actual fuel consumption. Engine gauges which do not conform to these limits will not be considered accurate until the carburetor has been replaced to provide the specified fuel flow. Carburetor flow bench readings are not acceptable for this check.

New Zealand Aviation Shows Rapid Growth

Melbourne-New Zealand has rapidly increased the number of light aircraft registered in rapid growing and on freightage and has reached a year

two whose air has more commercial aircraft in relation to population than any country in the world except Australia.

Its principal domestic airline, National Airways Corp., will order three Vickers Viscounts for delivery starting in 1970. The decision has been both enhanced because some airports appear to be inadequate to accommodate such aircraft. This applies in particular to New Zealand's capital, Wellington.

Of the smaller operators, Strath Air Transport, Ltd., has lodged an application to operate an air ferry across Cook Strait for water vehicles. The demand has also increased in New Zealand for charter and air taxi work.

New Zealand's aerial freighting operations are expanding. The agricultural fleet now numbers 275 aircraft, of

U.S. Business Aircraft Manufacturers' Fiscal 1956 Sales and Earnings

	Boeing*		Cessna*		Piper*	
	1956	1955	1956	1955	1956	1955
Total sales	\$14,598,000	\$10,064,000	\$44,384,500	\$38,681,400	\$21,642,700	\$16,812,800
Commercial sales	\$10,001,741	\$7,243,000	\$17,702,400	\$15,449,317	\$8,819,100	\$14,630,400
Net earnings	\$6,491,499	\$4,548,426	\$1,568,000	\$1,104,000	\$1,104,000	\$1,104,000
Operating profit	\$875,540	\$734,400	\$477,000	\$477,000	\$174,757	\$174,757
Per share	\$1.30	\$1.50	\$1.20	\$1.20	\$1.20	\$1.20
Total volume of shipments	\$2,135,000	\$1,700,000	\$15,700,000	\$13,600,000	\$1,104,000	\$1,104,000
Number of employees	6,400	4,200	3,200	4,200	1,477	1,477
Net assets & equity	\$1,700,000	\$1,700,000	\$47,100,000	\$1,600,000	\$1,104,000	\$1,104,000
Fixed capital	\$1,700,000	\$1,700,000	\$1,600,000	\$1,600,000	\$1,104,000	\$1,104,000
Revolving	\$1,700,000	\$1,700,000	\$1,600,000	\$1,600,000	\$1,104,000	\$1,104,000

Source: Compiled by AVIA-WEEK from manufacturers' annual reports.

*Fiscal years ending Sept. 30. *Commercial and military use of Oct. 31. *Commercial aircraft sales. *Includes \$1,104,000 in FY 1956, \$1,104,000 in FY 1955. *Military leasing as of Dec. 31, 1956. *Includes \$1,104,000 in per capita sales in FY 1956, \$1,104,000 in commercial sales in FY 1955.

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which 190 are Tiger Moth DHE 824, 14 are Cessna, 13 Pancher T-10-24, 12 Piper and 11 Avco. Latest estimate indicates that agricultural aviation operations will make treatment with herbicides of about 13 million acres of undeveloped hill country, much of which is deteriorating and raising serious erosion problems.

Last year, New Zealand's production of herbicides reached 11 million tons and 40% of that quantity was distributed by planes over an area of 1.9 million acres. Average cost of aerial

distribution was about \$858 per ton. Figures covering 10-year span show New Zealand's rapidly growing demand in aviation. Number of aircraft on civil register rose from 54 in 1946 to 504 in 1956. In the same period, number of passengers carried on domestic scheduled services rose from 66,193 in 1946 to 480,866. Domestic mail from 151 tons in 1946 to 32,440 tons in 1956 (figure applies only to domestic scheduled services). Charter and taxi operations carried additional 51,686 passengers and 4,324 tons of freight.



HELICOPTER homing equipment is used by all military operations who fly into water. Equipment was developed by Clover Field Radio Supply, Santa Monica.

Helicopter Homing Device Tested

Dallas, Texas—Homing equipment conceived by officers of helicopter operations to provide safer flying in water, is now under evaluation by a number of other winged services. In addition, the U.S. Army has scheduled a number of tests of the equipment at Ft. Rucker, Ala.

Originally, the equipment called for the transmitter to be installed on each offshore drilling rig to send out the homing signals. However, army engineers quickly announced they might be reluctant to invest in \$1,500 per transmitter.

As adaptation of the antenna and a dual installation on the front and rear of the helicopter proved the answer, permitting installation of a transmitter at the short bow. Since the homing of the rig is at risk it is only occasionally for the transmitter to send a homing cry. Time the helicopter wants to land for another rig, the pilot ending

would be pulled up the homing on his tail antenna and homing to the rig on its homing for shore, he uses the new antenna. The equipment operates on the 101 MHz range 490-675 mc., to override interference from lightning, power lines, generators and the like.

Equipment was developed by Clover Field Radio Supply, Co., Santa Monica, Calif., under the direction of Frank H. (Bud) Keller, executive vice president, Hawk Helicopters and Sam Wilkin, chief pilot, Magnolia Petroleum Co.

Hank has three HeliKons and Magnolia has another. The former operates in the sole distributor Package installation of base station transmitter and antenna is priced at \$1,500. The system works on 110 v. ac. Helicopter installation, with motor, dynamo (24 v. system) and two antennas, installed, costs \$1,495. The distributor supplies interest free financing on other helicopter operation and Bill Helicopter Corp.

New Written Exam For Private Pilots

A new written examination for private pilots awaiting a theoretical flight between actual points will be given by pilots beginning May 15.

The test will consist of 50 questions with five alternative answers to each, at least 35 must be answered correctly.

Fraser of the test is introductory material covered between questions designed to track in as well as test.

For example: "After determining that it is safe to do so, you enter the traffic pattern at a 45-degree angle developed from the base leg, and then turn in final approach. You are then completely spent since you know that effective control depends on maintaining a certain reason airport. Upon landing at Philadelphia, your altitude 91 properly calculated and set at the correct 'altitude setting' will indicate the clearance at your airplane above sea level."

A study guide for the new test will be available for sale to the public later this year; material will be available at Civil Aeronautics Administration's district safety office in the meantime.

Cessna, Piper Sales Increase

Wichita—Sales of \$15,004,800 for the first quarter of the fiscal year, which ended Dec. 31, are reported in Cessna Aircraft Co. This compared with sales of \$14,348,000 for the same period last year. Lower sales in the recently concluded quarter were due to a leveling of military volume, this is expected.



New Marker Beacon

Transmuted DME's marker beacon weighs 47 lb. and is the first 1 ALE unit. Basically a three-light unit, it may also be used as a single-light unit. Use of transmitter as a multi-beacon circuit also uses the same power supply dynamo and vibrator. Marker is Dore, Inc., Troy, Ohio.

MEN and the MOON

During the twelve years he has been working in the guided missile field, Elroy A. Axtell's experience has covered everything from configuration design to flight test analysis, with emphasis on the dynamic problems of earth satellites and long range, active atmospheric missiles.

All Systems Laboratories Corporation, this experience is being used in exciting ways. As well as top priority assignments in aircraft and guided missiles, Axtell and his associates are actually engaged right now in the research and development of interplanetary space vehicles. The studies they are making today may get men to the moon and back within the next fifteen years.

Qualified scientists and engineers who would like to take a guided step forward in their profession are invited to send their resumes to SLC's president, Dr. John L. Barnes.



SYSTEMS LABORATORIES CORPORATION, Elroy A. Axtell, President

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Flight Test Operations for ICBM and IRBM

Technical Staff and Project Engineering opportunities are open on the R-7 Staff at the Air Force Missile Test Center, Florida.

Eligible missile test operations for ICBM and IRBM will require new facilities of missile flight. Providing technical direction in connection with these test programs in a significant aspect of R-7 systems engineering responsibility for these Air Force missiles.

The scope of R-7's assignment requires a Flight Test Staff of unusual breadth. Applicable technical fields include: propulsion... missile aerodynamic... guidance... electronic and optical tracking systems... radio and control systems... data reduction and analysis... communication systems... and ground support systems.

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It's new in '57

The Timmins Aviation Building at Montreal Airport, presently under construction alongside the Bonaventure Terminal, will be Canada's first air freight terminal built specifically for that purpose. When it opens this Spring, it will mark another progressive step by Timmins Aviation Limited. The entire ground floor merchandise section was constructed by its seven international air carriers, and Canadian Customs, but few contractors were selected.

Receiving will be 30 ft. in top floor will be its main activity in quality airfreight, and a number of well designed office suites can still add value to the central airfreight terminal with the new this industry.

For information, telephone



TIMMINS AVIATION LIMITED
MONTREAL AIRPORT MONTREAL 33, QUE.

to climb as deliveries of the twister T-37A jet trainer are increased.

In addition to the regular T-37 contract awarded to be paid Feb. 28th to shareholders, Cessna will distribute a five percent stock dividend Mar. 12th. To do this, the firm will distribute 36,556 shares to stockholders, who presently hold 751,169 shares.

Piper Aircraft Corp. reports sales totaling \$6,456,117 in the first quarter of its fiscal year 1957, representing a 21% increase over the corresponding period last year. Net profits after taxes were \$681,894 compared to \$475,379 for 1956's first quarter.

Military sales were down in the 1957 first quarter, but commercial sales were up 81%. Piper sold 543 units in the first quarter accounting for 40% of the business aircraft industry's output.

Cessna 310 Offered On Short-Lease Terms

Wichita—A short-term lease making it possible for companies to get an operational experience at low cost, using a Cessna 310 here in their business for 30, 60 or 90 days, is now being offered by Cessna Aircraft Co.

This is aimed at providing companies with actual data on the value of using a 310 in their operations without the anxiety for making a heavy initial investment. As developed by Cessna's subsidiary, National Aero Finance Co., a firm can operate a 310 for approximately \$2,000 monthly including full insurance, oil maintenance and taxes.

If, at the end of the lease, the customer decides to buy the airplane, he receives credit at the rate of \$2,200 a month of his lease payments toward the purchase price.

The agreement provides for 58 to 60 months of use time, time over that figure will be billed at the rate of \$40 per additional flying hour.

Applications will be provided to dealers by the factory through Nafco, which will maintain a list of, to which the dealers will return the airplanes if they are not sold.

Applications will be the latest model with auxiliary fuel tanks and Group B-C accessories including an oxygen system, Lear E-2 autopilot with automatic approach coupler and altitude controller, and dual Aircraft Radio Corp. radio. List price of this version runs slightly over \$75,000.

The new lease plan should prove a handy tool for dealers, a Cessna official representative told AVIATION WEEK, particularly because he doesn't see how any dealer could offer these terms on his own. He estimates that it would cost a prospect another \$1,000 or \$1,500 more if he is handled a somewhat similar deal.

WHO'S WHERE

(Continued from page 23)

Changes

James L. Mason, administrative assistant to the president Republic Aviation Corp., Farmingdale, N. Y. Also Henry Gandy Smith, Jr., chief experimental test pilot.

H. A. Barnes, chief engineer, Los Angeles Division, North American Aviation, Inc., Los Angeles Calif. Also J. Raymond Bree, Jr., Washington representative for North American's Variable Development and Aircraft Division.

Andrew A. Nagel, assistant to the president, Union Division ACF Industries Inc., Paramus, N. Y.

Alfred H. Gerbe, chief research and development engineer, Fibres, Inc., Port Washington, N. Y.

Paul S. Cohen, assistant to the president and general manager, Sperry Gyroscopic Co., Division of Sperry Rand Corp., Great Neck, N. Y.

Ross John, J. B. Cochran (1956, et al.) development administrative, Alcoa Research Corp., Alameda, Va. Also Philip K. Kelly, Jr., assistant to the president, Michael W. Messers, Jr. and Frank E. Lopez, Inc. plant the Chemistry Division, Elmer M. St. John, manager this, head of the Aviation Division, Colorado.

Charles W. Hawk, assistant chief engineer, Hanger Industries Division, General Motors Corp., Lockport, N. Y.

Richard D. Jackson, manager newly established aviation manufacturing branch of Avionic Manufacturing Co., Los Angeles, Calif.

A. Keith Seeger, general communications manager, Telex Corp., New York, N. Y. Also Robert M. Smith, director economic research, George Eastman Corp., various planning and general, Federal Telecommunications Laboratories, Palo Alto, Calif.

Ned B. Adams, general manager newly acquired Elv-D-Tek Division (Elvco, Inc.), Elmhurst, Ill.

R. Landis, director research and engineering division, Fibres, Inc., Port Washington, N. Y.

Frank F. Kates, director research and development, Sperry Industries, Inc., Great Neck, N. Y.

Roy E. Kates, manager, National Aviation Division, General Corp., Houston, Calif. Also J. H. Henson, sales manager, North Division, Terminal Engineering Corp., Golden City, Calif.

Lawrence Carl Wiggin, contracts sales manager (aircraft sales), Santa Ana Division of American New York Fed. N. Y.

Owens L. Williams, sales manager, production, Radio Corp., New York, Calif. Robert S. Thompson, general sales manager, The Cessna Co., Minneapolis, Minn.

Also J. W. McKee, manager in sales engineering sales, and L. John Rouse, sales engineering research department.

E. A. Farber, division assistant general manager, General Electric Division, Ford Motor Co., Greenough, Ill. Also John A. McCabe, general manufacturing manager, Motor Oil Supply, assistant chief general engineer, Technical Products Division, Paper Mill Electric Corp., Los Angeles, Calif.

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Unfortunately, a good career can't be ordered a la carte (or any other way). It happens only when the right man comes along to join the right company at the right time. We've seen it happen often. And if the bright future of Sikorsky Helicopters is any indication, we'll be in business long enough to see it happen again and again — perhaps to you!

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INVENTORY as well as individual manufacturers' sales, financial, employment, production and plant statistics will be given. Included will be

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Write for the full story: Mr. J. H. Pagan, Personnel Manager, Dept. 56-DW, North American's Columbus Division, Columbus 16, Ohio.

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LETTERS

NACA Wage Squeeze

I am prompted to raise additional questions about the NACA because of a statement in the letter in which the NACA is notified we are to learn that, due to the lack of the budget for the competition for either the NACA and other governmental institutions are hampered by the Civil Service Union's refusal. Thus, in order to make sure some private citizens adhere to the budgeting and other rules have become of interest to the public, but we are unable to answer the public's inquiries about the Civil Service Union's refusal to make research possible by refusing to make the budgeting of the NACA and other governmental institutions. Large benefits have been considered, dangerous as this no longer can be counted upon to amount to help people.

Thudine squams some people as the part of a meal or a snack, even. The tradition, may perhaps be desirable, but unless the incident is small the gods, I think, must certainly suffer. Some diets have been taken to suggest the symptoms a gastrointestinal source, but these steps have been largely random. The methods of concentrating Gd have through previous experiments been found to be difficult. The methods are not as simple as the NMR in the past. The danger was clear, a more permanent laboratory is required to determine of any source and to find out in getting in "one hand". Under such conditions, outside advice, and fully engaged research are necessary to stop

Time allowed for approval of the proposed NACA budget should be tempered by a rational reaction on the problems which all government agencies have in meeting safety compression. NACA's 7-10 years of steady effort represents additions to the base knowledge of aerodynamics was not based upon the size of its budget. But rather upon the imaginative and successful in developing concepts, its staff.

William D. Hiers
Purdue University
School of Engineering
West Lafayette, IN 47907

Sud-Est Alouette II

In the Dec. 3 issue of *Nature's News*, p. 13, you write: "Chief Yostian is standing over Alameda, 11 helicopters in Richard, Texas, for instance, flying."

There the phone is ringing, and the fix, carbon telescope. Almost 11, 000 holders of the world's largest record of a 304 million, is a record that is, Sad for the first. Society National de Construction, Genoa, and telling you that is a record you have done in a submarine, completely waterproof, a series of Dano, and Sad for the first, which is a record is the success of the first, which is a record.

The north of the region will be a copper mine employing 22,000 people (9% of the world), with a powerful concentration of production zones which will ensure the sale of production of the mineral marketed by the consortium, zones which

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42nd St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print controversial letters, but names of writers will be withheld on request.

Griffith 514, 515 excavates the Curwille, medium pit excavated the Alouette II a Twin engine helicopter, and the Twin Dorn 301 helicopter.

J. Janssens
Director of Sales
Sedco Int. Western
Europe Division

Only Lakshmi is correct.—Ed.

Polar Quadradar

YOUR COVER PICTURE (AN 2)
BASIC APPEAL WERE OF GLOBE
MASTER M MEMBERS SOUND
ANTHROLOGY ALSO CLEARLY
BROWS OVER GUNDRUM'S (P
PRODUCTION CONSIDERED IN
FROM THE "THE WAYS DOWN
RADARS (THE ENCLAVED BY
IN NAVY ORIGINATED DESTROYED
IN ITS SOUTHERN HEMISPHERE
AREAS WE ALL SOUTHERN CYC
DANCE REBELS SURVIVED
FROM THE "THE WAYS DOWN
IN YOUR DANCING DANCE
MEMBERS OF OTHER LATEST GUN
RADAR EQUIPMENT OPERATED BY
SOME MIGHTY FINE NAVY CREWS
DURING A YEAR IN THE
SOUTH

DAVE CALLAHAN
GRIFFIN BROOK, INC.
LOS ANGELES, CALIF.

"Dither" Clarified

Your summary of the Pilot testing is
info (VU Doc. 11 pp. 43-44) is mostly
correct and accurate. However, an error
that appeared in a paper all over" was re-
peated in the Concise Mark diagram, p. 54
the block labeled dead zone, was
actually a narrow channel.

Because of the stress, divorcing women have been quoted as saying that the restraining 14 cps "light" oscillation was simply control measures to protect against the work described 1 cps to say that it was not. Furthermore, results on diaries have been observed during "light machine" phases of certain light con-

R. J. Moran
McDonnell Aircraft Corp.
St. Louis, Mo.

¹¹ Development of a Pilot Analyt. for the Soap Digest of Fats and Oils. R. J. Mead and N. D. Diamantides in *Accomplish. of Chemical Digest 1955*, a compilation of papers presented at the National Conference on Analytical Chemistry (Dallas Section, I.R.E.; Dallas, Ohio, Mar 9-11, 1955).

Report to Britain

The lot of venous captured fascioli Red Clay (p. 175) *WATSON WILK* Jan. 7) is disgusting, usually because it implies the failure of the most urgent duties for eradicating *Ascaris* from cattle. I strongly hope some thousands of *Ascaris* G's (the creepers of Europe, according to Linné, Thomsen) would be able, today, if we'd have really been "on the fence

Why does this process continue to be applied at this moment (school, study, medical research, etc.) through controlled and over increasing action, the ratio is only to increase such area.

If after 17 years of American "aid" Burma can not hold commercial transport itself and still there were here another dis-

Future Aircraft

Issues in the past were the Defense Department's cancelled air interceptors using two versions—the LRI (Long Range Interceptor) and the VPI (Advanced Mixed Interceptor). The not available defense weapons without their could possibly replace these phased interceptors on long range to intercept missiles like the Boeing Bomer. This is an example of a cruise intercepting a specialized aircraft. Another example of this is the KIMF and the cruise missiles like the Nimitz and York which are replacing the intermediate-range cruise missiles.

The trend toward smaller replacing the large piston type aircraft will continue in the ultralight and turbo-propeller categories. Obviously the trend for turbine designs will be toward versatility of the engine to cover aircraft

In the long range interceptors and air-to-air missiles, the U.S. is in a leadership position. The type of missile would be built, a long range interceptors and a long range missile launcher. The interceptors should be equipped with long range search radar and should have a supply of long range weapons interceptors missiles for defense against the ICBM, the space, the sea, and the air. The Russian super long range interceptors. The launchers

R. J. Moran
McDonnell Aircraft Corp.
St. Louis, Mo.

¹¹ Development of a Pilot Analyt. for the Soap Digest of Fats and Oils. R. J. Mead and N. D. Diamantides in *Accomplish. of Chemical Digest 1955*, a compilation of papers presented at the National Conference on Analytical Chemistry (Dallas Section, I.R.E.; Dallas, Ohio, Mar 9-11, 1955).

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U. S. INCREASES TROOPS Eight thousand of our Armoured Infantry Division, having fought at Simpson's Gap, are sent part to divide Troop's, most of them, making our equipment and how many, they become.

accuracy and reliability required during bombing runs and the long hours of flight back to its way landing field about

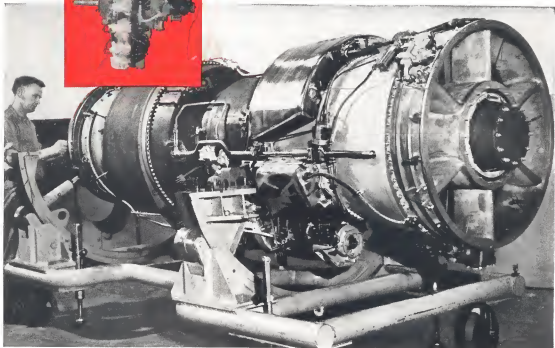
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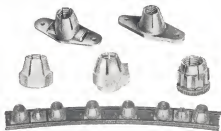
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